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ABSTRACT

This publication contains 19 papers presented at the inaugural meeting of the Australian Geographical Education Research Association held in Brisbane, December 1980. The papers surveyed a wide and diverse range of research. The introductory group of papers present several new views on curriculum development, course content, and teaching methods for geography teachers. The affective domain was highlighted by several speakers, which reflected the importance of attitudes and values in current research and teaching in geography. An example of a technique called "Values Probing" which provides an integrated and comprehensive approach to teaching values issues in geography is presented. Five papers relate to mapping geography. Two papers reflect a concern for the teaching effectiveness of geography textbooks. Teachers were the focus of research by two speakers. The conceptual structure of geography has received considerable attention in recent years. One paper describes the technique of quanitative content analysis which he has used to survey the conceptual structure of the discipline. Another paper investigates the use of one of the fundamental concepts of geography--the regional concept--with primary school children. The final two papers survey the nature of research in geographical education. (Author/RM)

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RESEARCH
IN
GEOGRAPHICAL EDUCATION

A collection
of the papers presented to the
inaugural meeting of the Australian Geographical
Education Research Association at Kelvin Grove
College of Advanced Education, Brisbane,
December 5-7, 1980.

Edited by

Peter Wilson, Rod Gerber and John Fien

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Cover Print: Free call sketch map of a road intersection by David aged
8 years 3 months in Year 3.

CONTENTS

INTRODUCTION

Peter Wilson, Rod Gerber and John Fien 1

CONFLUENT APPROACHES TO TEACHING GEOGRAPHY: HOW DESIRABLE? HOW FEASIBLE?

John Fien 5

TOWARDS A PROCESS MODEL OF CURRICULUM DEVELOPMENT

Louis Murray 20

NEW SOUTH WALES IN THE MIND'S EYE

Jean Thorpe 36

VALUES-PROBING: AN INTEGRATED APPROACH TO VALUES EDUCATION

John Fien and Frances Slater 46

COPING WITH THE REAL WORLD: PROBLEMS OF EXAMINING THE GEOGRAPHY SYLLABUSES FOR THE HIGH SCHOOL CERTIFICATE IN NEW SOUTH WALES

Mary Hall and Peter Irwin 57

ACADEMIC ASPIRATIONS OF TERTIARY GEOGRAPHY STUDENTS

Rohan Clark 80

CHILDREN'S DEVELOPMENT OF COMPETENCE AND PERFORMANCE IN CARTOGRAPHIC LANGUAGE

Rod Gerber 98

PROBLEMS IN THE IDENTIFICATION OF SOME TOPOGRAPHIC MAP SYMBOLS BY UNINITIATED CHILDREN - A PRELIMINARY INVESTIGATION FROM ZIMBABWE

Laura Davies 125

THE MAP REASONING DEVELOPMENT OF EIGHT, TEN AND TWELVE YEAR OLD PUPILS AS REVEALED IN FREE RECALL SKETCH MAPS

Peter Wilson 143

PERCEPTION OF LAND/SEA CARTOGRAPHIC DESIGNS BY URBAN STUDENTS IN GRADES 4, 8 AND 12

Geoffrey Jones 200

OBJECTIVE ANALYSIS OF SCHOOL ATLASES

Bert Sandford 234

READING AND UNDERSTANDING GEOGRAPHICAL MATERIALS

Kevin Laws 246

WHAT ARE WE REALLY TEACHING? PUPIL PERCEPTION ON A TEXT BOOK BASED GEOGRAPHY COURSE

John Lidstone 260

DEFINITIONAL ORIENTATIONS OF YOUNG SECONDARY SOCIAL STUDIES TEACHERS: SOME IMPLICATIONS FOR SOCIAL STUDIES TEACHER EDUCATION

Ian MacPherson 280

TWO SIDES OF ONE COIN? TEACHER DEVELOPMENT AND SCHOOL-BASED CURRICULUM DEVELOPMENT

Barrie McElroy 303

CONTENT ANALYSIS AS A TOOL FOR PROBING THE SUBSTANTIVE STRUCTURE OF GEOGRAPHY

Bernard Cox 322

REGIONAL GEOGRAPHY AND REGIONAL CONCEPTS IN THE PRIMARY SCHOOL

Margaret Row 334

RESEARCH IN GEOGRAPHICAL EDUCATION

John Wolforth 349

MAKING SENSE AND LOSING MEANING IN GEOGRAPHY EDUCATION RESEARCH

Leo Bartlett 365

INTRODUCTION

Research in Geographical Education is a publication of the papers presented at the inagural conference of the Australian Geographical Education Research Association (AGERA). AGERA originated from a perception that geographical education researchers in Australia do not have adequate opportunities to disseminate their findings and conclusions and to discuss them with their fellows on a regular basis. Also there is a need to foster geographical education research in Australia and to foster and maintain this research at an international level. AGERA was established to provide a forum to meet these needs.

AGERA aims to identify a group of individuals interested in research, to foster liaison between these individuals, to encourage a wide range of research and to meet regularly to discuss research. This research may cover all aspects of geographical education in the pre-school, primary, secondary and tertiary education areas. The research may cover the whole range of research in geographical education from simple studies such as a class's attitudes to field work or a simulation game, to stringently conducted basic research. AGERA has grown quickly, without a great deal of publicity, to comprise a small group of interested people from all parts of Australia and with members in Africa, England, New Zealand and North America. Obviously there is a felt need for such an interest group in the field of geographical education.

The papers presented at the inagural conference of AGERA surveyed a wide and diverse range of research in geographical education. Many of the themes in the papers were interrelated and, accordingly, the papers have been grouped into six broad categories. These categories reflect the curriculum and teaching process, research on mapping, teachers and teacher development, an analysis of textbooks, conceptual structures in geography and the nature of research on geographical education.

The introductory group of papers present several new views on curriculum development, course content and teaching methods for geography teachers. John Fien's paper which was the first presented at the conference asked participants to question the desirability and feasibility of confluent approaches to teaching geography. The discussion on his paper created a pattern which many speakers followed in encouraging questions and answers as a part of the presentation. Louis Murray's paper was derived from the same curriculum tradition as Fien's, in that he outlined how criteria could be established, and materials developed for a process rather than an objectives model of curriculum development. Jean Thorpe illustrated the same learner centredness that Fien and Murray had advocated in her paper which presented the results of place perception studies in New South Wales. Also, she presented ideas on ways this type of research could be carried out by teachers with their classes.

The affective domain was highlighted by several speakers, which reflected the importance of attitudes and values in current research and teaching in geography. Several techniques for values education in geography were reviewed by John Fien and Francis Slater. Also, they presented an example of a technique they are developing called Values Probing, which they believe provides an integrated and comprehensive approach to teaching value issues in geography. The last two papers in this group were by Mary Hall and Peter Irwin, and Rohan Clark. These papers looked at the role, scope and effectiveness of the New South Wales sixth form examination and student attitudes to success in geography studies respectively.

Five papers related to mapping in geography. Two were by overseas AGERA members, Laura Davies and Bert Sandford, who could not attend in person. Rod Gerber examined the development of children's competence and performance in cartographic language. He found that children do develop in their understanding and use of cartographic language from age eight to fourteen years and that this development varies according to different types of cartographic signs. Laura Davies focussed on one aspect of cartographic communication, that of symbol identification. She investigated the identification of twenty-two topographic map symbols by primary school pupils drawn from three cultural groups (African, Indian/Asian and European) in Zimbabwe. Peter Wilson described a technique he has developed to quantitatively score cognitive ("mental") maps. This technique extends the research use of such maps so that they can be used to assess children's spatial reasoning development. Both Peter Wilson and Rod Gerber concluded with several important implications for researchers curriculum developers and teachers. Geoff Jones surveyed a problem common to most geography teachers in his research into the ability of students to distinguish land from sea on black and white maps. He presented numerous maps to students in years four, eight and twelve and found that boys and girls in all years were almost unanimous in their preference. The final paper in this section is by Bert Sandford, an overseas member, who explained a method he has developed for objectively comparing school atlases. He applied the technique to several Australian and British atlases.

Two papers reflected a concern for the teaching effectiveness of geography textbooks. Kevin Laws looked at a problem of textbook design related to the location of questions and instructions to students in classroom materials. His findings suggested that learning was improved if such questions and instructions are placed at the end of textual materials rather than within or preceeding them. Today, many geography teachers are basing their courses around activity oriented textbooks and materials with little regard as to whether such materials provide successful geography courses from the students point of view. John Lidstone presents some startling findings of his investigation into students' reactions to two commonly used, activity-orientated textbooks that were used in his school.

Teachers were the focus of research by two speakers. Ian Macpherson investigated the relationships between the view of social studies held by classroom teachers in Pennsylvania and their pre-service social studies education courses. He explained the usefulness of an instruction system design approach in improving social studies teacher education. Barry McElroy investigated teachers' preceptions of, desire for and ability to cope with school based curriculum development. He suggested that school based curriculum development demands an extended professional role for the teacher, one which necessitates effective in-service programs.

The conceptual structure of geography has received considerable attention in recent years. Bernard Cox described the technique of quantitative content analysis which he has used to survey the conceptual structure of the discipline. The technique enables the identification of thematic elements in textual materials in geography. These elements can be used to recognize the structual concepts of geography. Margaret Row investigated the use of one of the fundamental concepts of geography, i.e. the regional concept, with primary school children. She found that the concept of 'region' could not be developed by primary school children. Only sub-concepts of the major concept could be developed and even these had to be fostered by explicit, repeated, child-centred, concrete learning experiences.

The final two papers in this publication survey the nature of research in geographical education. John Wolforth first presented a broad overview of the types of research that has been carried out in geographical education. He suggested three areas where further research is needed, i.e. spatial cognition, curriculum theory and the interface between geography and pedagogy. Likewise, Leo Bartlett looked to research needs in geographical education, but from the perspective of research methodology. He argued that there is a need for researchers to supplement experimental and psychostatistical research with descriptive and interpretive methodologies that appeal to the judgement of teachers, as well as offering them research results.

The papers from this inagural AGERA conference are a valuable contribution to our knowledge of geographical education. Each paper contains important implications for curriculum and/or classroom practice. The range of research in the papers clearly reflects the aims of AGERA. But it should be remembered that AGERA is more than a conference or a collection of papers. AGERA is a network of people with common interests, who plan to maintain, develop and expand the contacts they have made, share teaching and research design ideas, and exchange drafts of papers prior to publication.

These types of aims should allow the AGERA network to grow in the future. Any person who is interested in geographical education research is welcome to join AGERA by contacting the editors at Kelvin Grove College of Advanced Education, Victoria Park Road, Kelvin Grove, Queensland 4059, Australia.

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4

CONFLUENT APPROACHES TO TEACHING GEOGRAPHY:
HOW DESIRABLE? HOW FEASIBLE?

by John Fien*

Abstract. *This paper is a progress report on research I am conducting into the feasibility of confluent approaches to the geography curriculum. Confluent education is defined and its implications for a view of the nature of the learner, the nature of knowledge, the goals of geographical education and styles of curriculum development explored. The paper concludes with a series of questions to which I gladly would welcome a response. These questions are the key to the next phase of the research study.*

Confluent approaches to education are concerned with the development of the total person. A broad consensus exists in Australian society that the development of all human potentialities to the fullest possible extent should be the primary goal of education (despite present abberations to the contrary in the form of claims for core curricula with low levels of input from the humanities and social sciences). However, as with unfortunately too many educational goals, "the development of the total person" is one that has received scant attention from syllabus developers and teachers. It is, after all, an ambitious aspiration based upon a rather ambiguous phrase, "total person". It is only in the last decade with the development of humanistic or confluent education that detailed answers have been sought to the question of "What is a 'total person' ?" and explicit teaching strategies developed to make the goal attainable.

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Humanistic educators see the "total person" as one in whom both the cognitive and affective faculties of the mind are equally developed. They suggest that the development of the "total person" does occur as a natural process of living and mixing with people but that self actualisation or growth can be enhanced through activities provided by humanistically-oriented schools. The teaching approach they recommend has come to be known as confluent education. However, the terms humanistic education and confluent education are really synonymous. Confluent education approaches seek the bringing together of cognitive learning and affective learning to enhance the process of self actualisation for students and their development as total or "well rounded" people — a sort of person Brown (1971) describes as a "feeling - thinking" person. Brown defines confluent education as -

> *a philosophy and a process of teaching and learning in which the affective domain and the cognitive domain flow together, like two streams merging into one river, and are thus integrated in individual and group learning.*

Humanistic educators provide many justifications of the need for the integration of cognition and affect in education (see Rogers, 1969; Brown, 1971; Lyon, 1971; Jarrett, 1973; and Valett, 1977) but the one I consider most important for the scope of geographical education relates to the relationship between knowledge, values and action. In the words of Weinstein and Fantini (1975) -

> *The pervasive emphasis on cognition and its separation from affect pose a threat to our society in that our educational institutions may produce cold, detached individuals, uncommitted to humanitarian goals. Certainly a modern society cannot function without ever increasing orders of cognitive knowledge. Yet knowledge per se does not necessarily lead to desirable behaviour. Knowledge can generate feeling, but it is feeling that generates action.*

In a geographical context, we can take the examples of environmental ethics and behaviour. While we (or our students) may know all about the finite nature and delicacy of ecosystems or about the dangers of lead exhausts from cars, it will not be until we (or they) feel strongly enough about the issues, that any change in personal behaviours or actions to offset environmental dangers will be effected. Links must be forged between knowledge and action if reform in environmental behaviour is to be achieved. However, unless this is done via values, by relating knowledge to the affective state of the learner, the likelihood that knowledge will influence behaviour is limited.

Geographical education has moved away from factual learning and the concept of the passive learner in recent years and is now characterised by approaches that involve students in activity based learning. The emphasis, however, has remained squarely in the cognitive domain. The increasing popularity of inquiry-based syllabuses with their emphasis on the development of cognitive skills and inquiry processes are evidence of this. Even though a realisation of environmental problems and a concern for Third World development has introduced some values study into geography teaching, too often the introduction of values into the geography classroom has been too academic. In most cases when values are considered, the overriding emphasis is on the balanced analysis of issues and rational decision making. Little attempt is made to explore the value assumptions behind the cognitive arguments about an issue, to have students see how these values apply in their lives, or to have them examine their own environmental behaviour for its values base.

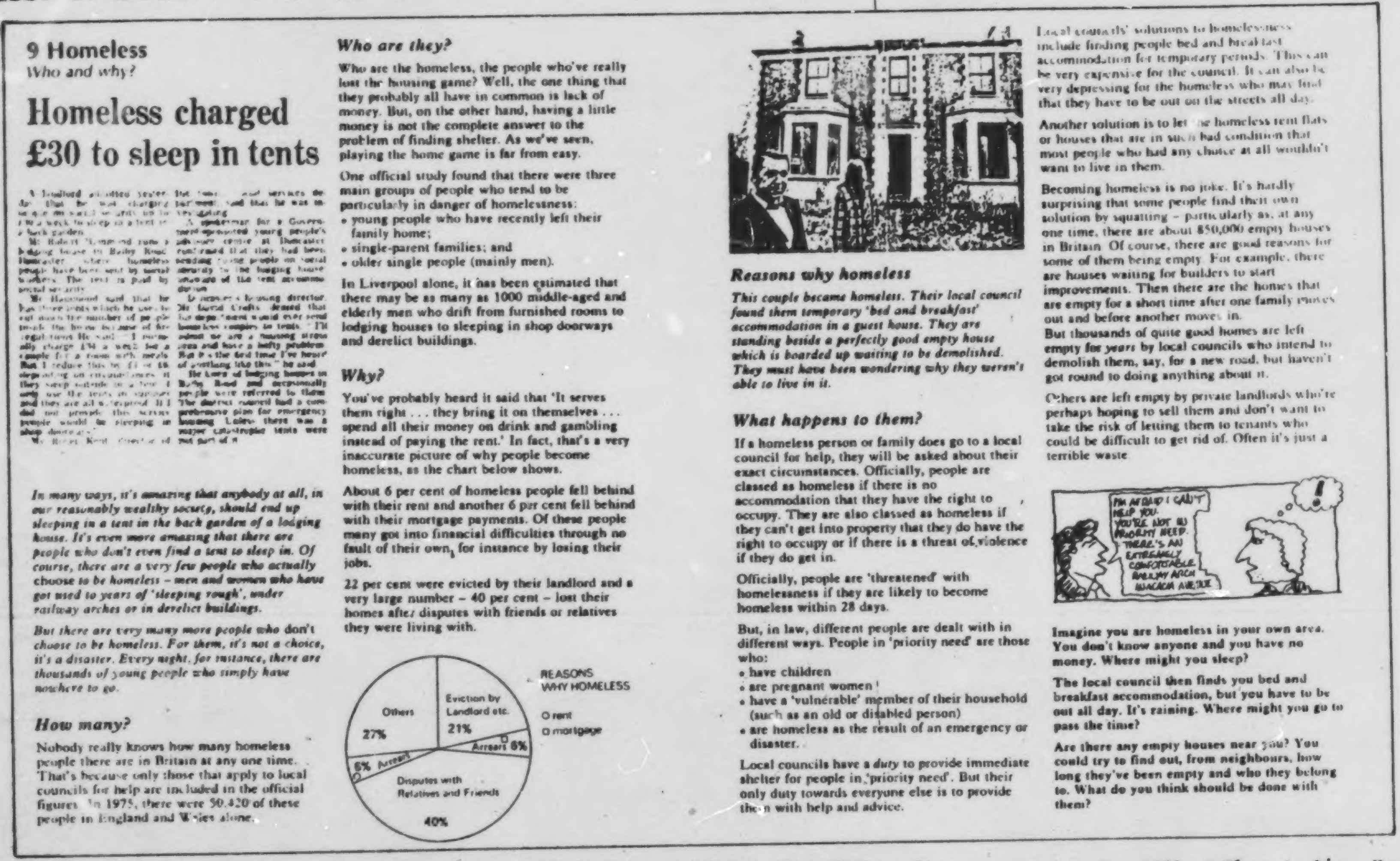
Salter (1977) uses the terms "spatial systems" and "idea systems" to describe the cognitive and affective aspects of geography. He claims that the failure of traditional geographical education to clarify the realtionships between the two has produced an imbalance between society's spatial knowledge and its environmental values. This, he maintains has led to the miseducation of

> *a generation of consumers who have learned to talk about the poor condition of the environment, but fail to see the role they play in its creation.*

There is a need in geographical education to redress this imbalance. This does not mean content should be thrown out but that it should be fused with affective learning in order to produce a confluent approach to geographical education. I have outlined elsewhere the historical movements towards confluent or humanistic approaches to teaching geography (Fien, 1979). This movement has been especially strong in Britain and to a lesser extent in the United States. It is illustrated, for example, in the philosophy and teaching suggestions of the Schools Council Art and the Built Environment Project (see *Bulletin of Environmental Education* Nos. 68, 72, 73, 78 and 92), the college courses of Romey and Elberty (1980), Kakela (1979) and O'Keefe and Halverson

(1979), the *Essences* kits of the American Geological Institute and school texts such as *Where You're At* (Goodey, 1974), *Utopia* (Ward, 1974), *A Place to Live* (Menzies, 1979), *Pencils in the Sky* (Menzies, 1979) and *People in Places* (Farbstein and Kantrowitz, 1978). The best Australian materials of this type are to be found in the Social Education Materials Project Kits on Urbanism entitled, *People and the City* and *People and Shelter*. Figure 1 is a reduced copy of a double page spread in *A Place to Live*. It illustrates many of the principles of confluent education. Note the humane and student-centred way in which an urban problem, homelessness, is treated. Note also the concern for people, the values stances advocated and the emphasis on self examination in the three exercises that complete the unit of work.

It is possible that the authors of these books may not recognise their ideas as "confluent education". Indeed, advocates of humanistic education claim that there is little new about it for it encompasses the ideas and work of what many concerned and sensitive teachers have been doing for many years. The only reference to confluent education and geography I have been able to locate is an article in *Journal of Geography* by Steinbrink and Jones (1979). In it they describe the fusion of cognition and affect in confluent education and show how this can be done in the geography classroom through a sample unit of work on petroleum production and consumption in the United States. However, the objectives, learning experiences and values clarification exercises in their unit are remarkably similar to those developed by Dinkele *et al* (1976) in the unit on "Electricity in Your Home" in the *Harraps Course in Reformed Geography* series. The difference really is one of intent: confluent education is a formalisation of the aspirations and strategies of such teachers into a coherent educational philosophy and approach to curriculum development and implementation.



9 Homeless

Who and why?

Homeless charged £30 to sleep in tents

In many ways, it's amazing that anybody at all, in our reasonably wealthy society, should end up sleeping in a tent in the back garden of a lodging house. It's even more amazing that there are people who don't even find a tent to sleep in. Of course, there are a very few people who actually choose to be homeless – men and women who have got used to years of 'sleeping rough', under railway arches or in derelict buildings.

But there are very many more people who don't choose to be homeless. For them, it's not a choice, it's a disaster. Every night, for instance, there are thousands of young people who simply have nowhere to go.

How many?

Nobody really knows how many homeless people there are in Britain at any one time. That's because only those that apply to local councils for help are included in the official figures. In 1975, there were 50,420 of these people in England and Wales alone.

Who are they?

Who are the homeless, the people who've really lost the housing game? Well, the one thing that they probably all have in common is lack of money. But, on the other hand, having a little money is not the complete answer to the problem of finding shelter. As we've seen, playing the home game is far from easy.

One official study found that there were three main groups of people who tend to be particularly in danger of homelessness:

- young people who have recently left their family home;
- single-parent families; and
- older single people (mainly men).

In Liverpool alone, it has been estimated that there may be as many as 1000 middle-aged and elderly men who drift from furnished rooms to lodging houses to sleeping in shop doorways and derelict buildings.

Why?

You've probably heard it said that 'It serves them right . . . they bring it on themselves . . . spend all their money on drink and gambling instead of paying the rent.' In fact, that's a very inaccurate picture of why people become homeless, as the chart below shows.

About 6 per cent of homeless people fell behind with their rent and another 6 per cent fell behind with their mortgage payments. Of these people many got into financial difficulties through no fault of their own, for instance by losing their jobs.

22 per cent were evicted by their landlord and a very large number – 40 per cent – lost their homes after disputes with friends or relatives they were living with.

Reasons why homeless

This couple became homeless. Their local council found them temporary 'bed and breakfast' accommodation in a guest house. They are standing beside a perfectly good empty house which is boarded up waiting to be demolished. They must have been wondering why they weren't able to live in it.

What happens to them?

If a homeless person or family does go to a local council for help, they will be asked about their exact circumstances. Officially, people are classed as homeless if there is no accommodation that they have the right to occupy. They are also classed as homeless if they can't get into property that they do have the right to occupy or if there is a threat of violence if they do get in.

Officially, people are 'threatened' with homelessness if they are likely to become homeless within 28 days.

But, in law, different people are dealt with in different ways. People in 'priority need' are those who:

- have children
- are pregnant women
- have a 'vulnerable' member of their household (such as an old or disabled person)
- are homeless as the result of an emergency or disaster.

Local councils have a *duty* to provide immediate shelter for people in 'priority need'. But their only duty towards everyone else is to provide them with help and advice.

Local councils' solutions to homelessness include finding people bed and breakfast accommodation for temporary periods. This can be very expensive for the council. It can also be very depressing for the homeless who may find that they have to be out on the streets all day.

Another solution is to let the homeless rent flats or houses that are in such bad condition that most people who had any choice at all wouldn't want to live in them.

Becoming homeless is no joke. It's hardly surprising that some people find their own solution by squatting – particularly as, at any one time, there are about 850,000 empty houses in Britain. Of course, there are good reasons for some of them being empty. For example, there are houses waiting for builders to start improvements. Then there are the homes that are empty for a short time after one family moves out and before another moves in.

But thousands of quite good homes are left empty for *years* by local councils who intend to demolish them, say, for a new road, but haven't got round to doing anything about it.

Others are left empty by private landlords who're perhaps hoping to sell them and don't want to take the risk of letting them to tenants who could be difficult to get rid of. Often it's just a terrible waste.

Imagine you are homeless in your own area. You don't know anyone and you have no money. Where might you sleep?

The local council then finds you bed and breakfast accommodation, but you have to be out all day. It's raining. Where might you go to pass the time?

Are there any empty houses near you? You could try to find out, from neighbours, how long they've been empty and who they belong to. What do you think should be done with them?

Figure 1: A TEACHING UNIT ILLUSTRATING KEY PRINCIPLES OF CONFLUENT EDUCATION. (Source: Menzies, W., 1979, *A Place to Live*, Harrap.)

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CONFLUENT APPROACHES TO TEACHING GEOGRAPHY:
HOW DESIRABLE? HOW FEASIBLE?

Elsewhere, I have explored the nature of humanistic perspectives in geographical education and their implications for our conceptions of the nature of the learner, the nature of knowledge, the branches of geography most suited to humanistic learning in geography and curriculum development and implementation models appropriate to confluent education in geography (Fien, 1979, 1980). In summary, I have argued that:

1. Students are geographers and that being a geographer is nothing more than the working of the human mind as it explores, perceives and acts in the environment.
2. The knowledge, skills and attitudes so gained constitute one's private geography. Private geographies contain many forms of knowledge not given credence in traditional approaches to geographical education. However, the "contents" of private geographies should be utilised as the starting point in all geography teaching because of their personal meaning and fusion of cognitive and affective experiences.
3. The goals of geographical education should focus on the refinement, extension and enrichment of private geographies. What is taught and how it is taught should be designed to help students cope more effectively with the environment in which they live and with the feelings and values they have in relation to it.
4. The geography curriculum offered to students should not be a completely organised and pre-planned instructional package. A top-down objectives based model of curriculum planning is inappropriate. A process model of curriculum development based upon the interaction of student and teacher in the selection of themes for study, learning experiences and modes of evaluation should be fostered for geography teaching. See Appendix 1 for a sample curriculum document based upon such a process or interactive approach.

Basing his ideas on structures developed by Hitt (1969), Hall (1978) has described two paradigms of geographical education — the positivist-behaviourist and the phenomenological-existentialist. Whether one would consider confluent approaches to geography teaching as envisaged in my four summary points as desirable is dependent upon the paradigm to which one subscribes. The positivist-behaviourist view currently dominates in geographical education and there are probably many people who would deny the desirability of the humanistic perspective in geographical education. However, the number of teachers becoming increasingly disillusioned with the anti-human constructs and dimunition of the role of values in contemporary secondary school geography is increasing. The question for such people and for those like myself who are committed to the phenomenological-existentialist paradigm is not of the desirability but of the feasibility of confluent appraoches to geographical education.

My current research is focused on the question of the feasibility of introducing confluent education approaches into the geography curriculum. I aim to develop further the curriculum model described earlier (Fien, 1980), train several teachers in its use, ask them to implement it with their classes and use a multiple case study approach to make an evaluation of the feasibility of this alternative approach to the geography curriculum. The content and learning experiences in the courses will largely be drawn from humanistic geography. Ley and Samuels (1979) and Tuan (1976) have provided overviews of the scope of humanistic geography and thereby suggested several themes that could be developed in courses such as those I would like to develop and evaluate. A list of such themes includes: place knowledge and memory, sensing the environment, place meaning and feelings, placelessness spatial range, feelings of environmental constraint and freedom, homelessness, environmental values and resolving environmental conflicts. These themes are illustrated in the range of sample unit titles suggested in Appendix 1. Many of the unit titles could just as easily appear in a work programme based upon the positivist-behaviourist paradigm of geographical education. For the purposes of a confluent approach to geography teaching, however, they need to be considered within the rationale and principles of procedure prescribed in the overall curriculum document.

I am at the stage in my research where I have completed a reading of the relevant literature, argued for the desirability of a humanistic or confluent approach to geographical education and developed a process based curriculum model for geography teaching. Before beginning to work with teachers and implementing the model, I would like to make a detailed examination of the feasibility of the approach within geographical education. I am presently considering a number of questions about this and would welcome any comments and advice you can give in the way of additional questions to consider, answers to them or problems you anticipate I may have. The questions include:

1. How desirable are confluent approaches to geography teaching?
2. Does confluent education in geography mean the demise of many of the good features and practices of the discipline-of-knowledge approach to geographical education?
3. Can the emphasis on cognition and affect in confluent approaches compensate for any such losses?
4. Are confluent approaches feasible given current thinking and movements in Australian education, for example, career and vocational training orientations, the "standards" and "back to the basics" movements, integrated lower secondary school social science courses, and anti-humanism among important political pressure groups?
5. Are confluent approaches appropriate in geography if other subjects students are studying do not use them?
6. Should confluent approaches be used some of the time in geography courses (e.g. where the rationale of particular units would deem them appropriate) or should the whole geography curriculum be based upon them?
7. Do external examinations or university geography course prerequisites demand that geography be taught as a body of content rather than confluently?
8. Could standards of understanding and skills in geography be maintained if confluent education approaches were implemented?
9. Are confluent approaches better suited to the lower secondary school?
10. If such is the case, would it be appropriate for confluent education approaches to start in the lower secondary school and diffuse upwards into more senior courses?
11. Are confluent approaches better suited to low achievers in geography as Graves (1979) has suggested of humanistic geography when he wrote:

    > *Its use in education could be extremely fruitful particularly with those students for whom short-term affective objectives are likely to be more successful than an appeal to long-term rationality.* ?

12. Would geography teachers, the majority of whom are only recently recovered from the upheavals of the "new geography" of the positivistic-behaviourist paradigm, welcome and be able to cope with the changes confluent education would bring?
13. What would be the best forms of inservice training teachers who find the confluent approaches appealing?
14. What are the questions I need to ask in my case studies?

APPENDIX 1

A SAMPLE CURRICULUM DOCUMENT DESIGNED IN ACCORDANCE WITH A HUMANISTIC PERSPECTIVE IN GEOGRAPHICAL EDUCATION

This curriculum is designed for first year secondary school students in Australia. While the curriculum is designed for this level, the rationale and principles of procedure out-lined are relevant to the curricula of all ages of geography students.

RATIONALE

From the humanistic perspective the major contribution a curriculum in geography can make to the education of a student is assistance in understanding the geography of everyday life. This necessitates a focus on the perceptions, knowledge, skills and values that comprise his private geography in an attempt to make it a richer and more systematic way of exploring and understanding the spatial elements and problems of daily life. From such an approach to geographical education, a student may expect to be:

1. better able to perceive the environment with all his senses as a conscious rather than unconscious process;
2. more open to the impact of the environment on his senses and more aware of the factors that are influencing his interpretation of it;
3. able to undertake a more systematic approach to the recognition and interpretation of the elements of a landscape that facilitates the development of clear and accurate environmental images or cognitive maps.
4. better able to recognize the elements and atmosphere of a landscape from which he and other persons may develop a sense of place;
5. more cognizant of and better able to empathize with the environmental beliefs and values of the people with whom he is daily associated and even those he may never meet who live, perhaps, in vastly different environments in different parts of the world;
6. more capable of analyzing the values-laden issues that are encountered in daily life;

7. better able to display environmental behaviours consistent with his beliefs and values; and
8. more cognizant of the decision-making processes of society and how changes can be effected in people's environmental attitudes and behaviour.

PRINCIPLES OF PROCEDURE

The following principles of procedure have been designed to enable teachers to plan learning experiences that are compatible with the humanistic perspective in geographical education and are thus capable of allowing students to obtain maximum personal benefit from the course. To this end, teachers may find the following eight steps a useful model of curriculum implementation to adopt:

1. an identification of the learners and learning groups within the class;
2. an analysis of the private geographies of students to ascertain their spatial and environmental needs, concerns and interests;
3. an analysis of the contribution geographical education can make to the environmental needs, concerns and interests of students;
4. an identification of the organizing ideas of geography that can be used to provide structure to programmes of geographical education based upon the private geographies of students;
5. the selection and framing of content vehicles;
6. an identification of the learning skills needed for, and/or that can be developed through the selected content vehicles and organizing ideas;
7. a determination of teaching strategies that will allow teachers to link the content vehicles, skills and organizing ideas with the private geographies of their students;
8. a selection of approaches to evaluation that will allow student, peer and teacher decision-making about the nature and value of the curriculum and their contributions to it.

The adoption of these eight steps in curriculum implementation will facilitate the development of geography courses based upon the following criteria:

1. Curriculum Content and Organization
   - (i) Content should be selected to accord with students' concepts of reality;
   - (ii) Content should be selected to cater for students' environmental and spatial needs, concerns and interests;

(iii) Content based upon the private geographies of students may be structured around the three levels of environmental perception — the world view students have from perceptions determined by the limits and needs of the human senses, the cultural view they share with members of the same cultural group and their personal view of the world determined by their age, sex, personality, personal history and imagination;

(iv) The concepts of geography should be used as a framework with which to link content into a structured programme.

2. Learning Skills

A developmental programme for the teaching and improving of students' learning skills should be formulated. Provision should be made for the following three types of learning skills:

(i) Basic skills such as reading, writing, oral communication, computation, observation, hand-eye co-ordination and graphicacy;

(ii) Skills of inquiry and critical and creative thinking such as data interpretation, problem-analysis, problem-solving and decision-making;

(iii) Personal skills in the affective domain.

3. Learning Experiences and Teaching Procedures

The learning experiences and teaching procedures selected should be those that encourage students to develop greater awareness of their environment and of their feelings towards it and more systematic approaches to the use of the skills in their private geographies. Appropriate learning activities include:

(i) class discussion;
(ii) group activities;
(iii) simulation, gaming and role-play;
(iv) field work based upon sensory walks, town trails, townscape notation and evaluation;
(v) landscape aesthetics and evaluation;
(vi) landuse planning activities;
(vii) values clarification exercises; and
(viii) a phenomenological mode of inquiry.

4. Evaluation

Evaluation should be oriented towards students, peer and teacher decision-making about the nature and value of the curriculum and each person's contribution towards it. Appropriate approaches include:

(i) intuitive analysis by students and teachers;
(ii) criterion-referenced tests on specific skills;
(iii) attitudinal surveys and scales; and
(iv) the methodology and systematic manner with which students approach field work and assignments.

SAMPLE CURRICULUM UNITS

Curriculum units should be designed upon the needs, interests and concerns dominant in students' private geographies. Consequently, only each teacher's observation of his own students will reveal appropriate areas of content for them. Content areas or unit titles that may be revealed in this way include:

(i) What information about the environment do we need for survival? How is it obtained?
(ii) The environment and basic human needs for food, clothing and shelter.
(iii) The environment and secondary needs such as emotional security, a sense of place and recreation.
(iv) The effects of age and sex on perception.
(v) The effects of one's location and environment on perception such as the effects of isolation, crowding and culture.
(vi) How do humans react to natural hazards?
(vii) What is it like to be new in an area?
(viii) What is the best way to learn to find one's way about a new town or region?
(ix) What is it like to be an established resident in an area? What things do you see more clearly? What things do you miss?
(x) What are the characteristics of places you like? What influences you in this?
(xi) In what sort of house would you like to live?
(xii) In what sort of town do you live?
(xiii) Are there sufficient recreational facilities in your area?
(xiv) The design for an ideal neighbourhood or town plan.
(xv) Where would you like to live? Go for a holiday, etc.?
(xvi) What makes school grounds good school grounds?
(xvii) Does your neighbourhood or school have a traffic problem?
(xviii) What can you do about waste disposal, pollution, etc.?
(xix) What can you do about the food crisis?
(xx) What do you think about wilderness areas? How would you like them to be managed?

Source: Fien, J., 1980, "Operationalizing the Humanistic Perspective in Geographical Education", *Geographical Education*, Vol. 3(4).

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18

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TOWARDS A PROCESS MODEL OF CURRICULUM DEVELOPMENT

by LOUIS MURRAY*

Abstract. This paper presents some characteristics of a 'process' model of curriculum development as these are reflected in properties inherent in both criterion pedagogical activities and selected content. The central premise of the paper is that curriculum and pedagogy can be ordered satisfactorily without recourse to an explicit means-ends model.

The latter section of the paper deals descriptively with the development of a high school geography curriculum materials kit in which application of process criteria to core geographical concepts, largely through a consideration of sample agricultural practices in Western Australia, is made.

A consideration of numerous curriculum and pedagogical plans reveals that, typically, they work a priori from an initial and explicit educational objective. Such objectives are often operationalized through the use of behavioural terms. It is assumed that overt behaviour demonstrations are amenable to evaluative treatment through various kinds of measurement devices. Articulate critiques of the conventional objectives model of curriculum development point to the tendency in the model to assume that attainment of explicit objectives necessarily reconciles curricular problems and ameliorates tensions and ambivalence in instructional strategies.

An able critique, such as the one provided by MacDonald-Ross (1975), is helpful as it points the way towards meaningful alternatives. Thus Stenhouse (1975) poses the following important question:

> *Can curriculum and pedagogy be organized satisfactorily by a logic other than the means-end model?*

By direct implication the question raises the notion of whether there can be principles for the selection of content and learning experiences which are not explicitly predicated upon the achievement of formal objectives. Following Stenhouse, I would contend that principles do exist, and that they can be included under the generic category of 'process'. To enunciate a process model of curriculum development therefore is to elaborate: a) upon properties of selected activities that are not constrained by unyielding specifications of objectives; b) upon properties of the content selected independently of reference to student behaviours.

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PROPERTIES OF PEDAGOGICAL ACTIVIES IN PROCESS MODELS OF CURRICULUM DEVELOPMENT

In enquiring about the pedagogical properties of learning activities in process models we implicitly request a visible relationship between the elements of 'worthwhileness' as perceived and the means by which such worthwhileness is made available. Peters (1959) has used the phrase "principles of procedure" to describe this relationship. In geography, for example, the concept of location is of criterion importance, yet it is highly problematic when confronted independently of a precise context. It follows therefore, that in geography teaching the nature of the locational and similar dilemmas should challenge a variety of interests, orientations and abilities. Such 'challenges' become translated through process rubrics into: the active use of media, symbols and data; the making of informed choices and reflection on the consequences of these choices; typical engagement in cognitively based enquiry strategies allied to visible problems; and an acceptance of the 'risk' factors incurred in decision-making and which may imply definitions of 'success' and 'failure'.

These learning activities are informed by the conceptual qualities of the problem under scrutiny. Philosophically they are judged to be intrinsically worthwhile. Judgments are defensible because the activities can be seen as:

i) remaining close to the expressive purposes of the people pursuing them, especially in terms of motivation and enthusiasm as pre-conditions to learning;

ii) operating relatively independently of a formal institution's filtering process (in the sense that school pedagogies tend to reflect 'agreed' versions of what is appropriate);

iii) offering the possibility for revision and modification and the extension of activity as the problem becomes altered and shaped by changes in the objective conditions in the environment;

iv) implying a measure of participation in the planning, control and implementation of particular active strategies;

v) being unconstrained by notions about the constancy of ability within particular age cohorts or the need for academic differentiation as a function of the variability in rates of learning.

A consideration of the criteria of worthwhileness of activities is important because it may provide information about instructional procedures. In the objectives model this is often not the case. The relationship between an aim as a statement of behavioural intent and the activity that may be used in the attainment of the aim is often attenuated, and frequently premised more on faith than on any perceived logical connection between the behaviour and its attendant activity. The antecedent nature of behavioural objectives compounds the issue. In the process model on the other hand, 'intent', 'attainment' and 'activity' are not mechanistically differentiated.

A further concern relates to the idea of modes of enquiry appropriate to the domain of contextual or disciplinary knowledge. Stenhouse (1975) authoritatively suggests:

> ' . . . *the principles which obtain for knowledge within a field are problematic within that field. It is part of the nature of knowledge that such principles should always be in some sense provisional and open to debate.*'

The distinction here between a corpus of knowledge (geography for example) and the means by which such knowledge is obtained, generated and transmitted is salient to the notion of 'process'. The procedural principles that are established for particular curricular activities in turn should reflect the problematic and transient nature of the content principles that exist within the particular corpus of knowledge or discipline. The conceptual structure of the discipline of geography is not immutable. Its primary concerns change over time and so also do the means by which such concerns are made publicly available. It follows then, that pedagogical devices such as curriculum plans, syllabi, etc. should seek to distinguish between what counts as valid and invalid pedagogical activity within the perspective of the contemporary rubrics of the discipline (geography) under review. Valid activities will not only reflect the problematic nature of the body of knowledge, they will also hold out the possibility for renewal of the knowledge itself.

PROPERTIES OF CONTENT IN PROCESS MODELS OF CURRICULUM DEVELOPMENT

Classic positions in curriculum theory (Tyler, 1949; Taba, 1962) indicate a range of problems associated with the learning of descriptive information. These include such things as a tendency to learn rote fashion rather than learning to apply, a rapid rate of forgetting, concomitant inabilities to organise information, the propensity for recall to be characterized by vagueness and inaccuracy, and poor evaluative mechanisms for assessing the validity and contemporary meaning of information. Part of this problem is pedagogical; a possibly more significant part of it is content related.

Traditional school geography, with a heavy descriptive and regional emphasis, has suffered from the problems listed above. More recently, arguments within the discipline, about its conceptual structure and about the integrity of its methods, have been partially responsible for the establishment of a fairly eclectic and overly academic conceptual model of geography becoming established at the higher age levels in our schools. I have argued elsewhere (Murray, 1977) about the instructional problems associated with this phenomenon. Suffice to say that the most significant trends in school geography in recent years have been a movement away from the static description of categorical data towards a concern for process and causation. This trend has several very real and concrete implications for classroom teachers. It means that they must, amongst other things, be able to:

i) extrapolate from a body of content, and make the extrapolations available typically in the form of theoretical concepts which may be functionally manipulated;

ii) influence pedagogical strategies which enable pupils to analyze rather than describe data.

Cause and effect in man-land relationships is essentially problematic. By implication, a consideration of such relationships involves speculation and sensitivity to the values based issues that are inevitably raised in any review of these and similar relationships. In this way, 'content' comes to influence the conduct of roles in the classroom. The teacher is equally a learner and the pupil is equally a teacher. This is true not in the sense that each have proportionate access to the same knowledge. *Rather it suggests that both have mutual and reciprocal obligations in the learning process.* The process is one that requires immersion in, and a philosophical understanding of, the structure of the discipline being manipulated. 'Content' is here a two-way relation. It is the precise and visible problem before the senses and it is the articulation of that problem against the 'deep' structure of its parent discipline.

'Understanding', because it always holds out the possibility for deepending is not to be considered a precise aim. In the process model there is always dispute about what constitutes a valid understanding, a valid interpretation. However, the disciplines of knowledge provide a framework of content criteria which can be used for the basis of justification.

It is possible to outline major geographical concepts that feature in significant conceptual schemes (for example, see Morrisett, 1967) for the discipline of geography. These concepts are:

LOCATION - DISTANCE - DISTRIBUTION - ENERGY
MOVEMENT - INTERACTION - COVARIATION

They are essentially organizing and reference concepts. They have merits for bringing general order into particular information; and particular order into general information. Perhaps more importantly, they may enable pupils to become sensitive to the cognitive hierarchy within the discipline of geography. This is what is primarily implied by the notion of 'justification'. The concepts are a referent against which the meaningfulness of discrete sub-sets of contextually specific information can be evaluated.

A key property of an item of content in the process model is its conceptual possibility. As data becomes rapidly obsolescent and tends to lose its applied relevance, the concept which sub-sumes the data becomes more important. *Concepts are units in terms of which we think; they are basic organizing ideas.* The public nature of their 'meanings' suggests an implicit propensity for APPLICATION and, in consequence, the[illegible]nd to have greater 'staying-power' at the level of individual intellect. The antecedent and successive nature of disciplinary concepts (for example, 'direction' and 'distance' preceding 'scale') also provides information about SEQUENCE; for the structuring of pedagogical activities, and for the ordering of information in the individual mind.

In summary we can say that 'content' in the process model is characterized by:

- information capable of generating intense and varied impressions thus increasing the likelihood of learning;

- information which is used frequently and in functionally varied ambient circumstances;

- information which has been deemed worthy to be learned and which has been scrutinized for subjective as well as general meaning by clients, and which is most typically made available in the form of public concepts;

- information which is organized according to its visibly cumulative and logical properties, generally reflecting the cognitive structure or hierarchy within a discipline.

FIGURE 1. SUMMARY CHARACTERISTICS OF THE PROCESS MODEL OF CURRICULUM DEVELOPMENT

PEDAGOGICAL CHARACTERISTICS	1	ACTIVE AND INSTRUMENTAL USE OF MEDIA, DATA, ARTIFACTS
	2	ENGAGEMENT IN COGNITIVELY BASED ENQUIRY STRATEGY
	3	THE MAKING OF SELECTIONS AND INFORMED CHOICES
	4	REFLECTION ON THE CONSEQUENCES OF CHOICES
	5	ACCEPTANCE OF THE 'RISK-FACTORS' INVOLVED IN DECISION-MAKING
CONTENT RELATED CHARACTERISTICS	1	CONTENT CAPABLE OF GENERATING INTENSE AND VARIED SENSORY IMPRESSIONS
	2	CONTENT CAPABLE OF FREQUENT AND FUNCTIONALLY VARIED USE
	3	CONTENT SCRUTINIZED FOR BOTH SUBJECTIVE AND GENERAL MEANING
	4	CONTENT WHICH IS MOST TYPICALLY AVAILABLE IN THE FORM OF PUBLIC CONCEPTS
	5	CONTENT ORGANIZED ACCORDING TO ITS VISIBLY CUMULATIVE AND LOGICAL PROPERTIES

* THE NUMBERING SUGGESTS THE INCREMENTAL AND INCLUSIVE NATURE OF THE CHARACTERISTICS.

THE GENERAL ORIENTATION OF THE PROCESS MODEL

Compromises between an objectives and a process model of curriculum development are eminently possible. However, in what Stenhouse describes as its 'pure' form, the process model implies a role for both teacher and pupil as 'critic'. If, for example, we are to maintain an intellectually honest commitment to geography as a predictive science, enquiry, speculation and appraisal must be part of our procedure. Stenhouse (1975) succinctly states this point:

> *"For the key procedures, concepts and criteria in any subject, cause, form, experiment, tragedy, - are, and are important precisely because they are problematic within the subject. They are the focus of speculation not the object of mastery."*

Certain obligations reside in this stance. The model is not an examinable one in the direct sense. It cannot be directed towards formal, public examinations for that would be to deny the worth inherent in the model. Students taught on the process model can be examined but this is incidental, a by-product of the pursuit of more educationally subjective aspirations. The process model places a premium of value on understanding rather than on graded attainment. It may be that process models are of considerable importance in areas of the curriculum where knowledge and understanding are central but problematic (as in the case of geography). Such models may act as a useful countervailing force against external pressure for examinations and may also provide a valid alternative to centrally specified syllabi and content statements.

Clearly then, process models are strongly committed to instructional flexibility, particularly as this affects teacher development. Teacher professionalism is at stake in the process model. The opportunity exists for the extension and refinement of the standards of judgment within a subject. This is in marked contrast with the objectives model as it applies to knowledge. Specifying behavioural objectives for the cognitive domain may (and typically does) occur without incremental recognition of the wit, sagacity and prudence of individual teachers. 'Process' does not attempt to limit individual development to the advantage of collective, measured attainment.

Any process model makes heavy demands on teacher judgment and initiative, but at the same time it offers a high degree of opportunity for personal and professional development. It may operate most effectively in areas of the curriculum which have a primary emphasis on comprehensive knowledge.

PROCESS MODELS WITHIN THE GENERAL CONTEXT OF ENQUIRY LEARNING

The 'loose' educational movement that can be labelled the enquiry/inductive/discovery 'methods school' has been responsible primarily for providing remarkable insights into the relatively threadbare understanding that educators have of the nature of instruction. That this has occurred as a latent rather than manifest function is, I think, a comment on the plausibility and (short-lived?) ascendancy of fashions and foibles within educational circles.

Arguably, the most realistic and theoretically well-grounded statements outlining the problems and possibilities of inductive methods in instruction generally (and geography, by implication, in particular) have been provided by Ausubel (1972) and Bruner (1977).

> *For Bruner, intellectual development is crucially related to the structural unity of knowledge and its mode of representation to the senses.*

Inductive procedures which do not take account of this in the planning stage seem unlikely to succeed.

Accordingly, the data base provided for such procedures should be markedly ICONIC; that is, the data should be image-creating and impressionistic to the senses. Typically we are here referring to the provision of graphic, visual (and auditory?) stimulus data, capable of generating active responses in the minds of learners.

Con-comitant with its iconic mode of representation, data should hold out the possibility for active manipulation and transformation. Map-reading, for example, is unquestionably best learned by doing. The ENACTIVE mode of representation is believed to be a primary facilitator of learning. Where possible, children should confront problems of educational significance through the enactive and secondly, the iconic mode. This does not have to be an exclusive process but we should remember the educational maxim that derives from Bruner's comments: *"The more concrete and active the learning experience, the more likely will it achieve its desired outcome."*

If SYMBOLIC learning (Bruner's third mode of representation) is demanded without sufficient prior or parallel experience of the iconic and enactive modes of representation it is highly likely that induction will be compromised. Instead, a rote learning or categorical data description syndrome will arise in which the desired transformation of data and the cognitive gains desired, simply do not occur.

In the process model of curriculum development Bruner's message is interpreted as follows. The activities and content initially attempt to broaden the perceptual experience of pupils by providing direct sensory experiences. These experiences are linked to introspection and inference-making through varied use of instrumental skills. However, possibilities for work within the modes of representation can be SERIAL (enactive -- iconic -- symbolic) OR they can be PARALLEL where all three modes are used in conjunction. This is consistent with the view of the process-model that puts the inquirer in the position of 'meaning-maker'. The integrity of the learner's self-concept (as it is mediated by his expressive and instrumental purposes) is safeguarded by this immanent condition.

Ausubel, having reviewed numerous research studies and in contrast with Bruner, is much more cautious in his advocacy of discovery techniques. The tentative supports that derive from the Ausubelian position and which implicitly operate in process models relate to: particular conditions in the transmission of subject matter, the tested meaningfulness of learning, the implications of problem-solving, and the centrality of motivation in learning.

The availability of what Ausubel terms "concrete empirical experience" in the transmission of subject matter may operate to, figuratively speaking, induce inductiveness. The careful use of materials and artifacts, clues and signs, symbols and images, prompts the internalization of expanded meaning possibilities for new or partly familiar ideas. As the learning task increases in terms of data complexity and instrumental difficulty, 'prompted' induction probably -

> *"enhances intuitive meaningfulness by intensifying and personalizing both the concreteness of the experience and the operation of abstracting and generalizing from empirical data."*
>
> (Ausubel, 1972; p.483)

Improvements in linguistic capacity, success with previous experiences, and greater cognitive sophistication (exponential products of a school career) suggest increased opportunities for inductive outcomes during the transmission of a body of knowledge.

A necessary use of inductive process occurs when a particular increment of learning is examined for meaningfulness and depth in context. For example, a child who as a result of a period of expository instruction, understands 'scale' to be the means of determining real distances should, on encounter with structured materials, be able to generate additional properties for the term. That is, scale is a ratio of reduction or enlargement in pictures, maps and diagrams. The term 'encounter' suggests the possibility for the transformation of perceived applications of tasks (and data) prior to their incorporation into cognitive structure.

Inductive processes are centrally implicated in problem-solving. The novelty of particular data cases and contexts is a severe test of a student's inductive powers. In cases where the 'problem' is itself problematic, as in many examples of industrial location and agricultural practice, the requirement for problem-solving behaviour is manifest. The presentational structure of a case (for example, a type study of farming in the Avon Valley of Western Australia) may provide guidance for the learner but there is still considerable need for discovery if principles and generalizations are to be formed.

The incremental confrontation with, and the solving of problems, may lead to greater powers of transfer. The 'truth' of this proposition is related to the frequency of novel, problem-oriented cases acting as exemplars and which evoke recognition when they recur in varying contexts.

In any consideration of inductive process, motivation must be considered a criterion variable. It is reasonable to believe that motivational drives, deriving from the intrinsic rewards of discovery, would be far more salient for future learning than any externally impelled drives. Ausubel points out the high status accorded to discovery in our culture and the tendency for status to create its own rewards. However, the cultural factors may not be all that important. From the learner's point of view, success at 'discovery' is likely to yield cognitive gains in that further 'problems', are likely to be of the learners own deliberate construction. To such a learner, categorical data frequently available in reception-based instruction, is only meaningful if it holds the possibility for problem-making as well as problem-solving.

THEORY INTO PRACTICE

Using the theoretical rationale of 'process' rather than outcome, the author has undertaken (under the aegis of the School of Teacher Education at the Western Australian Institute of Technology) the development of a media-based curriculum materials kit for Year 12 geography students in Australian high schools.

The kit is entitled "Brookside Farm - an Integrated Model of Man in His Environment', and it focuses on key geographical concepts whilst at the same time emphasizing agricultural processes in the Avon Valley district of Western Australia. Although the learning experiences in the package are committed to the development of fundamental geographical competencies, the design of the project attempts to formulate a coherent statement of the learning process without being overtly constrained by an explicit and unyielding statement of precise performance objectives.

DESCRIPTION OF THE MATERIALS

'Brookside' is a not untypical farm of the Western Australian wheat belt located some 10 kilometres south-west of the town of Northam and approximately 100 kilometres east of Perth. The property (essentially pastoral) covers 1366 acres and is in an area which has been productively farmed since about 1870. The W.A. wheat belt is currently one of the most productive and economically significant agricultural regions in W.A.

Agriculture is of enormous significance to the Australian economy. In providing school pupils with a set of high quality materials that allow them to 'explore' various connotations associated with farm practice, we may not only underscore the importance of agriculture but consider a range of concepts consistent with contemporary thinking in geography. In line with the major theoretical premises of the process model therefore, 'Brookside' provides learning experiences which orient towards the inculcation of an enquiring and conceptual approach to geographical phenomena. In this sense the perspective of the materials is analytical rather than descriptive.

The organizing concepts around which the activities are structured are derived from those geographical commonalities clearly presented by McCaskill (1973) and adapted to agricultural studies by Connolly (1967). The concepts and their attendant categories of specific geographical data are tabulated in Figure 2. Working through the activities to implicitly explore the expanded meanings of such concepts is regarded as of greater merit than the more straight forward sample study of the farm. *It should be understood that the concepts are not necessarily* *exclusive or discrete.* They are however, central to contemporary descriptions of the structure of the discipline of geography. When treated systematically they provide a coherent, and intellectually honest, picture of the landscape and man's interaction with it.

The materials do not set out explicit steps for the development of particular geographical skills as this would be inconsistent with process criteria. The activities do presuppose however, a moderate degree of pupil competency in instrumental map skills. From this presupposition the broad instructional intent of the package is fashioned as follows.

1. To develop pupils' understanding of, and competence with, geographical techniques and instrumental skills.

2. To give pupils a more refined understanding of farm life and farming process.

3. To outline, and provide opportunities for the comprehension of some of the relationship between physical features of the landscape and human activities.

4. To provide pupils with an appreciation of the scope of man's role in modifying the environment.

5. To facilitate the development of an understanding of the associative qualities of different phenomena which comprise the physical and human geography of an area.

6. To promote interest and enjoyment in the study of geography and to motivate pupils towards a positive commitment to the discipline as a valid mode of social science enquiry.

Note that no attempt is made to distinguish these attainments on the basis of, a) observable terminal behaviours, b) precise criteria of affect, cognition or motor-skill. The flexibility or reflexive potential in these attainments is guided both by the theoretical process criteria outlined earlier and also by the problematic nature of the content under review. Although Brookside is reasonably representative of 1000 - 3000 acre Avon Valley properties in W.A., its 'typicality' is not independent of the decision-making context within which farming activities proceed.

The contents of the curriculum package are primarily directed towards senior (year 12) geography pupils in Australian high schools. It is also possible for the materials to be used selectively with junior classes. The materials are designed for a maximum class size of 24. This permits eight groups of three pupils to work with single copies of a topographical map, a data card and a learning experiences document. The activities are of an inductive, skills based nature. They are grouped under the headings of topographical mapping, location and photo interpretation; climate; hydrology; specific farming activities; future prospects.

The curriculum package contains:

8 topographical maps. Northam Sheet 2234 - IVSE Series R811, 1:25,000, 1974.
1 set of colour slides, 28 in total.
2 aerial photographs. W.A. 1410 Perth Run 13. 18/9/72 - to be used as a
    stereo pair.
1 set of teacher's notes plus slide commentary.
1 master copy sketch map Northam shire.
1 master copy sketch map Northam district.
1 master copy sketch plan Brookside Farm.
1 master copy soil sampling sheet.
1 set of printed notes on farming at Kojonup.
8 copies of a learning experiences card.
8 copies of a data sheet.
1 OHP transparency of organizing concepts.

The opening statements of intent in the package attempt to blend the intrinsic worth of geographical study with a realistic, and feasible use of graphical and interpretive skills. An examination of the *worthwhileness* of the activities indicates that they are primarily pupil centred, involve the active manipulation of media artifacts and data, locate in the realm of ideas as well as the world of facts, focus on a crucial aspect of human economic activity, and provide pupils with a utilitarian propensity for map reading. The last point is most important. Graphicacy is generally regarded as the most conspicuous and pervasive characteristic of the competent geographer. We may not be able to study Brookside enactively in the field but we can at least use it as a data base upon which to practise our geographical skills. Brookside learning experiences provide an *opportunity for the rehearsal and practice of instrumental skills in the manipulation of theoretical concepts that are applicable to wider conceptions of the discipline.*

CONCLUDING REMARKS

Process criteria have been used to guide the selection and organization of learning experiences in a curriculum materials package because they are both philosophically defensible and honest to the context within which the materials were researched. It is inappropriate to provide tight specifications for agricultural geography based on information gleaned from a single farm's operational calendar. Also, the study setting within which the materials will be used cannot be predicted with any certainty. The materials must in consequence maintain a high degree of flexibility whilst at the same time proffering visibly worthwhile activity. I would ask teachers to equate the usefulness of the materials with their own instructional objectives in making clear an important facet of our culture, at the same time as illuminating the structure of the discipline of geography.

FIGURE 2. ORGANIZING CONCEPTS FOR A SAMPLE STUDY OF BROOKSIDE FARM, NORTHAM, W.A.

CONCEPTS	ANALYTICAL CATEGORIES	CLASSES OF SPECIFIC INFORMATION FOR BROOKSIDE
LOCATION	LATITUDE - LONGITUDE	117° E 32° S
	STATE - SHIRE	W.A. - NORTHAM
	PHYSIOGRAPHY - CLIMATE	AVON VALLEY - MEDITERRANEAN
	SERVICES - MARKETS	ROADS/RAILWAYS - PERTH
DISTANCE	EXTERNAL - AFFECTING MARKET DEMAND AND SUPPLY	100 KILOMETRES FROM A METROPOLITAN MARKET.
	INTERNAL - AFFECTING LAND USE ALLOCATION	TRAILBIKES MEDIATE TIME ALLOCATIONS TO INTERNAL ACTIVITY
DISTRIBUTION	SURFACES	GRAZING ON GRANITIC SLOPES.
	LINES AND NETWORKS	CROPPING ON ALLUVIAL FLATS.
	POINTS AND NODES	WATERING THROUGH GRAVITY.
		PADDOCK SIZE, FENCES, FUNCTIONS
ENERGY	HUMAN - MECHANICAL	16 MAN HOURS PER DAY FOR 7 DAYS.
	SOLAR - ELECTRIC	PLOUGHS, TRACTORS, SCARIFIER.
	WIND - GRAVITY	PUMPS, WINDMILLS, SALT EXTRACTION
MOVEMENT	EARTHQUAKES - EROSION	EARTHQUAKES AND WATER SUPPLY.
	SALINATION - SEDIMENTATION	SALTS AND SEDIMENTS IN DAMS.
	CHEMICAL CHANGES	PATERSONS CURSE SUGAR CONTENT
	BIOTIC CHANGES	GRASS SEEDING
	RELATIONSHIPS:	
	SLOPE/SOIL TO LAND USE	GRAZING ON HIGHLAND
INTERACTION	SCOPE TO PRODUCTIVITY	INTENSIVE/EXTENSIVE PIGGERY
COVARIATION	CROPPING TO LIVESTOCK	GRAIN GROWN FOR STOCK FEED
	INTENSIVENESS TO FERTILISATION	100 LBS OF FERTILIZER PER ACRE
	DECISION MAKING TO LAND MANAGEMENT	AERIAL TOP DRESSING AND CLOVER SEEDING. 40 MILES OF CONTOUR BANKS

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NEW SOUTH WALES IN THE MIND'S EYE

by JEAN E. THORPE*

Abstract. *One way of investigating perception of the environment is through the place preference approach. Peter Gould in the U.S.A. and Rodney White in Great Britain constructed perception surfaces based on the rank orders assigned to different areas of those countries in terms of residential desirability. This paper reports on two surveys carried out by students of the Armidale C.A.E. which attempted to construct perception surfaces of N.S.W. on the basis of preferences reported by high school students in various parts of the state and using greatly simplified statistical analysis appropriate to replication in the classroom.*

One significant aspect of the relationship between people and their environment is the way in which they perceive that environment. One, among a number of techniques which have been devised to investigate environmental perception is the measurement of preference for one place over another. In a pioneer study in 1966 Peter Gould(1) asked first year students at the universities of California, Minnesota, Pennsylvania and Alabama to rank the forty eight contiguous mainland states of the U.S.A. in order of preference as a place of residence. In a later study Rodney White(2) similarly asked school leavers to rank the ninety two countries of England, Scotland and Wales. The techniques which were employed to combine these individual responses into a composite view are described in *Mental Maps in 1974.*(3) They involved quite sophisticated statistical analysis and access to a computer. The results of their analyses were expressed as maps of perception surfaces. In both studies two significant patterns were apparent. In almost all the centres surveyed there was a strong preference for the local area which outweighed the desirability of any other part of the country. Apart from this local preference, respondents from widely separated centres shared similar perceptions of the country as a whole.

In 1977 geography students at the Armidale C.A.E. carried out a survey, based on the work of Gould and White, to measure the perceptions held by Year 10 high school students in N.S.W. of the different environments in that state. The survey was designed to meet three objectives: 1. to provide College students with practical experience in researching the field of environmental perception,

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2. to demonstrate a technique for measuring perception of place character simple enough to be applicable to the school classroom and 3. to provide empirical data as a resource for the classroom teacher.

Following upon the results obtained by Gould and White, two hypotheses were advanced.

1. *The highest preference will tend to be given to that area in which the respondent lives.*
2. *Such local preference excepted, there will be considerable congruence of perception as to the most, and the least, attractive parts of the state.*

The results of this survey followed those of Gould and White as far as support for the second hypothesis was concerned but varied considerably in relation to the first hypothesis. Of the twenty four schools surveyed, all but four gave their first preference to one region - the North Coast. Gould and White(4) have commented that school children are inclined to hold favourable images of places associated with vacation activities. Therefore it was considered probable that the age of the respondents had contributed to this result - that the image of the North Coast was one of sun, surf and sand rather than of the realities of the region as a whole.

In 1978 therefore, the survey was repeated, this time directed towards adult respondents - parents associated with the schools surveyed in 1977. Again two hypotheses were tested.

1. *Adults will be more influenced by familiarity with, and loyalty to their local region than was evident among school students.*

2. *When the preferences of all respondents are combined, the pattern will be similar to that for school students, but the degree of preference for the North Coast will be less marked.*

This paper describes the methodology used in both surveys, presents the basic conclusions to be drawn from each and draws comparisons between the perceptions of the two sample populations. It also considers some implications of this type of research exercise for teaching Geography concepts in the school classroom. A full report of the basic data, the maps of perception surfaces constructed for each region and a discussion of the resultant patterns is contained in *NEW SOUTH WALES IN THE MIND'S EYE* - A survey of mental impages.(5)

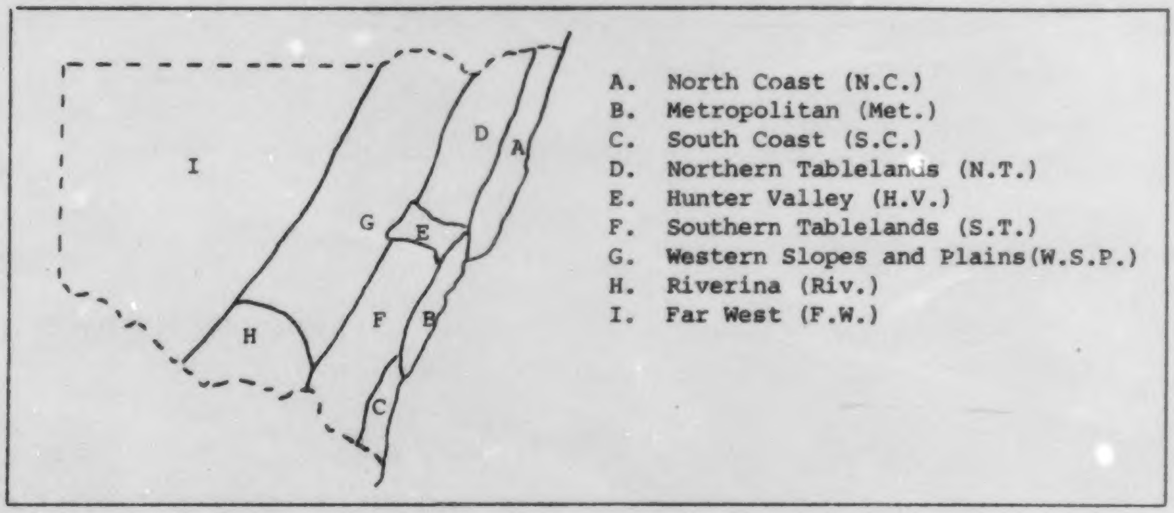
METHODOLOGY

The design of the survey was determined by analytical procedures appropriate to a class exercise for College students and to replication in the school classroom. Its main purpose was to provide empirical data to test the hypotheses and to become the basis for further activities which might be designed by teachers.

1. The survey form presented a map on which New South Wales was divided into the nine regions shown below. The abbreviations in parentheses are hereafter used to identify the regions in tables. The purpose of the survey was explained and respondents asked to imagine that,

   > *You are in your twenties, just embarking on married life, and have the opportunity to move to a new home and employment in any part of New South Wales, choosing freely in terms of where you would like to live.*

   They were then asked to rank the regions from first preference (1) through to last preference (9). They were also asked to indicate whether they had previously lived in any other region and which regions they had visited.


I
D
A
G
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C
A. North Coast (N.C.)
B. Metropolitan (Met.)
C. South Coast (S.C.)
D. Northern Tablelands (N.T.)
E. Hunter Valley (H.V.)
F. Southern Tablelands (S.T.)
G. Western Slopes and Plains(W.S.P.)
H. Riverina (Riv.)
I. Far West (F.W.)

FIGURE 1. Regional Divisions of N.S.W. used in the survey.

2. Twenty eight centres throughout the state were selected, the number in each region being roughly proportional to its population. A high school in each centre was approached with the request that Year 10 students be allowed to act as respondents. Completed survey forms were returned from twenty four schools, a total of 862 respondents.

3. The first step in analysis was to tabulate the preferences of respondents in each centre. The rank order was then reversed so that a first preference became a score of 9 points, second preference 8 points and so on to last preference which gave a score of 1 point. The scores given to each region were then added and divided by the number of respondents from the centre, thus giving an average score which could be compared with scores derived from other centres.

TABLE 1. Procedure for deriving average scores from rank order of preference.

	PREFERENCE				SCORE			
	N.C.	Met.	S.C.	N.T.	N.C.	Met.	S.C.	N.T.
Respondent A	1	4	2	5	9	6	8	5
Respondent B	2	1	3	6	8	9	7	4
Respondent C	1	3	2	7	9	7	8	3
					26	22	23	12 ÷ n
			Average Score		8.7	7.3	7.7	4.0

These average scores became the basic data for further analysis. The number of centres located in each region varied from one (the South Coast) to five (the Metropolitan region). Therefore regional views were obtained by averaging the scores given by all centres in each region.

4. Maps of the view from each region were constructed by treating the average scores as "spot heights' and plotting "contours" to suggest a perception surface as was derived from more sophisticated statistical analysis by Gould and White. The two presented (on the next page) illustrate the methodology employed.

5. In the study of British school leavers, White constructed a national view by combining the perception surfaces derived from each of the centres. In this study, a composite state view was obtained by averaging the scores of each of the regions.

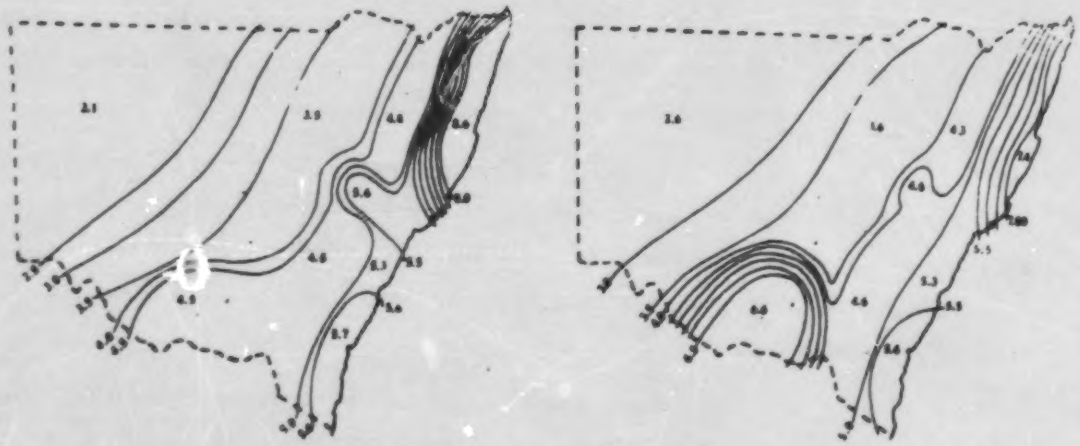
6. The average scores used in the foregoing analysis disguised the degree of variance between individual respondents from each centre. Finally, therefore, all respondents were treated as one population. Their preferences were tabulated and the percentage of respondents giving each rank order to each region was calculated.

The view from the North Coast.

	N.C.	Met.	S.C.	N.T.	H.V.	S.T.	W.S.P.	Riv.	F.W.
Murwillumbah	8.57	5.40	5.20	5.15	5.40	4.42	3.75	4.65	2.47
Coffs Harbour	8.51	5.61	5.76	4.74	5.43	4.23	4.05	4.33	2.30
Taree	8.93	4.93	6.12	4.59	6.15	5.00	2.96	4.59	1.68
North Coast	8.67	5.31	5.69	4.82	5.66	4.55	3.58	4.52	2.15

The View from the Riverina.

	N.C.	Met.	S.C.	N.T.	H.V.	S.T.	W.S.P.	Riv.	F.W.
Leeton	7.23	5.89	5.65	3.71	4.76	4.65	3.76	6.68	2.63
Deniliquin	7.64	4.80	5.60	4.92	4.52	4.72	3.60	6.60	2.60
Riverina	7.43	5.34	5.62	4.31	4.64	4.68	3.68	6.64	2.61


View from the North Coast

View from the Riverina

PERCEPTIONS OF NEW SOUTH WALES

Some interesting patterns emerged from the survey of high school students. The hypothesis, *that first preference will tend to be given to that area in which the respondent lives*, was not supported. All but four of the centres gave first preference to the North Coast. The North Coast was represented by three centres, so seventeen centres preferred it to their own region. Eleven of these gave second preference to their own region, but in six centres there was no evidence of local loyalty and in some cases a marked aversion (Bourke 6th, Broken Hill 5th, Lithgow 4th, Goulburn 4th, Glen Innes 3rd and Killara 3rd).

The four centres which ranked their own region above the North Coast were all located along the coast (Cardiff, Matraville, Wollongong in the Metropolitan region and Bega). When centre scores were averaged to provide regional views, only the South Coast ranked its own region above the North Coast. When however, each regional view is compared with the composite state view, it is apparent that in all cases, the local view of a region is more favourable than the general view.

TABLE 2. Strength of local preference over State view.

	Local Regional Score	State Score	Difference
North Coast	8.67	7.46	1.21
Metropolitan	7.19	5.54	1.65
South Coast	8.10	5.78	2.32
Northern Tablelands	5.94	4.63	1.31
Hunter Valley	6.78	5.52	1.26
Southern Tablelands	5.61	4.74	1.27
Western Slopes and Plains	6.58	4.09	2.58
Riverina	6.64	4.78	1.86
Far West	4.73	2.51	2.22

While some degree of attractiveness attaches to the familiar local region, it appears to be not nearly as strong as was the case in the surveys carried out by Gould and White.

The second hypothesis, *that local preferences excepted, there will be considerable congruence of perception as to the most, and the least, attractive parts of the state*, was supported. Distribution of preferences from each region shows virtual unanimity in preference for the North Coast and aversion to the Far West.

TABLE 3. Rank orders assigned by regions compared with state view.

	N.C.	Met.	S.C.	N.T.	H.V.	S.T.	W.S.P.	Riv.	F.W.
N.C.	1	4	2	5	3	6	8	7	9
Met.	1	2	3	6	4	5	8	7	9
S.C.	2	3	1	6	3	7	8	5	9
N.T.	1	3	5	2	4	6	7	8	9
H.V.	1	3	4	6	2	5	8	7	9
S.T.	1	3	2	6	5	4	8	7	9
W.S.P.	1	8	4	7	3	6	2	5	9
Riv.	1	4	3	7	6	5	8	2	9
F.W.	1	4	3	9	5	8	6	2	7
State	1	3	2	7	4	6	8	5	9

In Table 3 rank orders allocated by each region are compared with those derived from the composite state view. While there is less agreement about 2nd and 8th placings, in general the coastal or near coastal regions of the Newcastle-Sydney-Wollongong metropolitan region, the South Coast and ths Hunter Valley are preferred over the Tablelands and the Western regions. In Table 4 the scores allocated by each region to the other eight regions and those of the composite state view show a considerable similarity of perception.

TABLE 4. Regional views of non-local regions compared with state view.

	N.C.	Met.	S.C.	N.T.	H.V.	S.T.	W.S.P.	Riv.	F.W.
N.C.		5.31	5.69	4.82	5.66	4.55	3.58	4.52	2.15
Met.	7.38		6.15	4.55	5.51	5.12	3.27	4.06	1.70
S.C.	6.92	5.48		4.15	5.48	4.10	3.56	4.51	2.66
N.T.	7.98	5.61	5.09		5.18	4.59	4.40	4.12	2.04
H.V.	7.57	5.83	5.61	4.64		4.94	3.46	4.22	1.88
S.T.	7.39	5.71	5.76	4.62	5.42		3.51	4.37	2.56
W.S.P.	7.11	4.35	4.92	4.71	5.32	4.75		4.90	2.30
Riv.	7.43	5.34	5.62	4.31	4.64	4.68	3.68		2.60
F.W.	6.73	5.04	5.09	3.94	4.83	4.34	4.77	5.76	
State	7.46	5.54	5.78	4.63	5.42	4.74	4.09	4.78	2.51

The marked preference for the North Coast and the very marked aversion for the Far West is demonstrated even more clearly when all respondents are combined and the allocation of their preferences analysed. The actual allocation of preferences for these regions is shown below.

Preference	1	2	3	4	5	6	7	8	9
North Coast	376	173	109	65	42	33	42	14	8
Far West	28	20	35	38	34	45	40	104	518

Another interesting feature is the distribution of preferences for the Metropolitan region which is distinctly bi-modal, it receives almost as many last preferences as it does first. The Metropolitan region was represented by five centres with a total of 195 respondents who accounted for nearly half of its first preferences. Table 5 which separates country and metropolitan respondents shows that country respondents in particular, are ambivalent in their attitudes towards this highly urbanised and highly industrialised region - either attracted to, or repelled by it. While metropolitan respondents have a generally favourable attitude towards their own region, a significant number gave it last preference.

TABLE 5. Country and Metropolitan views of the Metropolitan region.

Preference	1	2	3	4	5	6	7	8	9
Country	84	132	83	60	41	34	42	57	124
Metropolitan	81	33	25	12	9	8	3	1	23

The main conclusions to be drawn from the survey of high school students are:

1. While there is a degree of loyalty to the local region it is not as strong as the results of the American and British studies suggested it might be.
2. There is widespread agreement in perceptions of the state irrespective of the location of the respondents. In general there is a gradient of desirability which declines steadily away from the coast. Although this pattern was not unexpected, the preference for the North Coast was stronger than anticipated.
3. Perception of the metropolitan region is highly polarised, only 19% of all respondents assign it to one of the middle ranks. Thus its score of 5.54 in the state view represents an average of extremes. In comparison, the Hunter Valley with a state score of 5.42 is assigned to one of the middle ranks by almost 50% of respondents.

These results raised questions about the degree to which the age of the respondents had been a significant factor. The following year therefore, the survey was repeated with respondents drawn from parents associated with the schools surveyed in 1977. While the number of individual responses (414) was adequate to provide an adult view, the geographic distribution of those responses over only sixteen centres made valid comparisons with the previous survey difficult.

However some significant differences may be noted. The first hypothesis, *that adults will be more influenced by familiarity with, and loyalty to, their local region,* was strongly supported. Eleven of the sixteen centres gave first preference to their own region. The five which did not, included all four metropolitan centres and Leeton. These centres all gave their first preference to the North Coast.

The second hypothesis, *when the preferences of all respondents are combined, the pattern will be similar to that for school students but the degree of preference for the North Coast will be less marked,* was only partly supported. When the state views from each survey are compared six regions occupy the same rank. The most marked differences are for the Northern Tablelands which improves from 7th to 4th rank and the Metropolitan region which drops from 3rd rank to 7th. The North Coast is still by far the most attractive region. Its average score has dropped by only .44 and its share of first preferences given by all respondents has dropped by only .2% (43.6% to 43.4%).

TABLE 7. Composite view of the state 1977 and 1978.

1977	N.C.	Met.	S.C.	N.T.	H.V.	S.T.	W.S.P.	Riv.	F.W.
Preference	1	3	2	7	4	6	8	5	9
Average score	7.46	5.54	5.78	4.63	5.42	4.74	4.09	4.78	2.51
1978									
Preference	1	7	2	4	3	6	8	5	9
Average score	7.02	4.49	5.87	5.27	5.71	5.10	4.21	5.11	2.17

The more favourable view of the Northern Tablelands is most marked in its own region but is evident in all regions. The less favourable view of the Metropolitan region is also widespread, although in two centres, Killara and Taree, adults have a slightly more favourable view of it. Distribution of individual preferences for the Metropolitan region is again bi-modal but in the adult view there are considerably more last preferences than first. In the view of country respondents in particular, there was a marked shift to the lower end of the ranking scale.

The adult respondents were also asked to provide reasons for their first three and last three preferences. The factor which appears to have contributed most significantly to both positive and negative perceptions is climate. In general, the North and South Coasts were perceived to have pleasant climates, while the Western Slopes and Plains and the Far West were perceived as too hot and dry. Attractive scenery was frequently mentioned in relation to the coastal regions, often associated with beaches. Negative responses to the Metropolitan region most frequently mentioned overcrowding, pollution and the "rat race". For the Far West, isolation was an important factor in its unpopularity.

IMPLICATIONS FOR TEACHING GEOGRAPHY CONCEPTS

One of the objectives in mounting this survey was to provide empirical data which teachers in the participating schools could use in the classroom as the basis for student analysis. Another objective was to demonstrate a simple technique which teachers could apply to school-based surveys. Cost may prohibit replication on a State-wide basis, but the methodology is applicable to a smaller scale. Some possibilities are suggested below.

1. A class could construct its own view of the State and compare it with those derived from the data presented here.
2. The same methodology could be applied to perceptions of sections of a town or suburbs of a city.

3. Students could investigate preferences for different types of vacation locations, within Australia or overseas.
4. In areas where there are diverse migrant groups, perceptions of Australia before and after arrival could be investigated.
5. In areas subject to hazards such as flood or bushfires, resident's perceptions before and after locating there would make an interesting study.
6. Respondents for these and many other possible exercises may be the students themselves, other students, parents or members of the community. A teacher may be able to co-operate with a teacher in another school so that perceptions of, for example, city and country respondents may be compared.

The value of such exercises are fourfold:

1. They provide practice in a number of research and analytical skills and the motivation of actually "doing research".
2. They provide empirical evidence to support such abstract concepts as environmental perception, mental maps and images of place.
3. Such evidence can be applied to actual changes in the environment. For example the desirability of the North Coast revealed in the surveys discussed in this paper, can be tested against actual movement of population to that area. For most people place preference must be subordinated to such factors as availability of employment, but one group, the retired, are free to re-locate on the basis of preference. A study of the growth and changing age structure of a town such as Port Macquarie would lend support to the idea that perception has an important influence on decision making.
4. Finally, students can be encouraged to analyse their own perceptions and the type of information they are based on and to speculate about the influence they might have on future decisions.

Such simple, practical and personal investigations can lay a foundation for understanding more complex concepts in relation to the way people perceive and act in their environments.

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VALUES-PROBING: AN INTEGRATED APPROACH TO VALUES EDUCATION

by JOHN FIEN and FRANCES SLATER*

Abstract. *The work described in this paper should be described as "developmental". It has arisen from our dissatisfaction with (i) the scarcity and inaccessibility of practical advice for teachers on various strategies for values education in geography, and (ii) the "incompleteness" of techniques such as Values Clarification, Values Analysis and Moral Reasoning/Development as avenues for teaching the many values issues in geography. The paper describes a strategy which we have called Values-Probing. We believe it provides teachers with a comprehensive and integrated approach to values education in the geography classroom. We are using it in schools and with our own classes and continually refining it. We invite you to study the approach and to use it with your classes. Any evaluations, suggestions or advice would be gladly received.*

Geography and geography teaching are values-based pursuits. Parallel articles by Cowie (1978) and Smith (1978) in the 1978 number of *Geographical Education* provided convincing arguments to this effect and, hopefully, have satisfied all doubts about the inevitability and importance of values in geographical education. Both writers insisted that the real issue no longer is debate on this topic, but the development of strategies for teaching geography that

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make allowances and provide opportunities for students to engage in values-based inquiry. Smith (1978) makes the point thus:

> *Whether we like it or not every part of teaching is based in some way upon values: the values of the students, the teachers, the subjects, the resources, the institution. Because of this, schools must face the question and problems of how to deal effectively with values as part of the educational process.*

Too much of the literature in geographical education that recognizes the values base of geography and geography teaching fails to go beyond the repeated verification of the arguments to the provision of detailed advice to teachers on exactly how to meet Smith's challenge. Read Shortle (1970, 1971(a), 1973), Blachford (1972), Smith (1974), Edynbry *et al* (1977), Watson (1977), Huckle (1977), Gilbert (1979) and Fien (1979) to see how little practical advice there is. The only references we can locate that redress this imbalance towards the theoretical are British theses by Cowie (1974), Huckle (1976), Welsh (1978) and Hartley (1980), unpublished A.G.T.A. conference paper by Smith (1976) and Simson (1980), an appendix to Blachford's 1979 article on environmental ethics, various papers by Kracht and Boehm (1974), Fien (1980), Slater (1980(a), 1980(b)) and Slater and Huckle (1980), an issue in the National Council for Geographical Education Instructional Activity Series, *But the Earth Abideth Forever* (Allen, 1975) and a chapter by Martorella (1977) in Manson and Ridd's *New Perspectives in Geographic Education: Putting Theory into Practice.* Note how relatively inaccessible to classroom teachers these "practical" aids are. Only Allen (1975) and Martorella (1977) of the dozen or so references provide a comprehensive coverage of the major values education approaches similar to the treatment of the topic in American social studies teaching methods books such as Oliner (1976). Both Allen and Martorella briefly review the nature of the major values education strategies (Values Clarification, Moral Reasoning/Development, Values Analysis and Action Learning) and then provide detailed examples that illustrate the teaching procedures involved in using the various strategies.

However, we are becoming increasingly dissatisfied with these techniques in the geography classroom for they remain just that — techniques. Each one has its own particular strengths and is suitable for use with particular topics, classroom objectives and learning experiences. It is important that geography teachers become aware of each of these techniques and their strengths in order to utilize them where their use would be appropriate. However, none of the techniques provides a comprehensive approach to teaching about a values question in the geography classroom. While it is all very well for teachers to be slotting values techniques into their lessons where they are appropriate, no technique is complete in itself or goes "far enough" in what it does to allow students to explore and understand a values issue fully.

Let us take Values Analysis for example. This technique was described by Metcalf and his team in the 1971 Yearbook of the National Council for the Social Studies. The technique is designed to allow students to arrive at a decision about a values issue on the basis of logical and objective inquiry. Briefly, the technique works like this. An issue is presented to students who are encouraged to appreciate that various individuals and groups hold differing positions on the issue and its resolution. Students list and discuss the arguments proffered by both sides after a study of materials on the issue. The arguments are then assessed for their veracity, relevance, logical coherence and implications. Finally, students select the solution they consider the best one to resolve the conflict.

The problem with this technique is that, despite its title, it does not really give students a chance to analyze *values* at all. In helping students consider both sides of a case and weight up alternatives, Values Anaylsis operates most on cognitive and not affective levels. Values are enduring personal beliefs about the morality of things. Values lie underneath the attitudes we form to issues and the judgments we make about specific actions, ideas and goals. Values, in effect, are the ethical principles by which we live. Values Analysis rarely allows students to discover the values underlying the arguments or to clarify their own values about it as Values Clarification does. Values Analysis is thus incomplete as a values education technique. Evaluations of Values Clarification, Moral Reasoning/Development and Action Learning reveal a similar weakness.

In teaching about a values issue in the classroom, the geography teacher wants to do so as comprehensively as possible. No research on what that entails has been done but we offer the following six aspects of what we believe would constitute a comprehensive approach to a values issue in the geography classroom for your consideration:

1. Issues should be relevant to students' levels of moral reasoning and interests and capable of activating their feelings, attitudes and values.
2. Students should have to react to an issue from personal perspectives and be able to justify their decisions.

3. Students should be called upon to evaluate their arguments and the arguments offered by alternative viewpoints.
4. Students need to probe beneath these arguments to discover the values that give rise to them.
5. Students should examine these values for their personal relevance in a values clarification exercise.
6. Students should be encouraged to publicly voice their values about the issue and be given opportunities to act on them when appropriate.

None of the techniques we have examined allow such a comprehensive approach to a values issue in the geography classroom. Our examination of these aspects of a comprehensive values strategy for geographical education has led us to develop an approach we have called Values-Probing. We developed it in early 1980 for postgraduate students of geographical education at the University of London, Institute of Education - and have been continually refining it since then.

The best way of describing the procedures involved in Values-Probing is to do so within the context of a particular values issue - What should we and the rest of Australia be doing about world hunger?[1] There are nine steps in using Values-probing with a class.

1. Introduce the issue to students in a motivating way and so that it activates their thoughts, feelings and values. Films such as *Rich Man, Poor Man, Tragedy or Triumph, The Ethiopian Famine* or *Hunger* from The Australian Freedom from Hunger Campaign could be used and followed by the petition exercise in Figure 1. Elsewhere, we have suggested that mock news pages, student produced video or audio-tapes or role plays could be used to introduce the issue (Fien, forthcoming 1981). Whatever stimulus is used, the key to this first step in Values-Probing is to get students to make a decision and to justify it. Instructions to students on this exercise would be to:
   (i) Read this petition addressed to the Prime Minister of Australia.
   (ii) Decide whether you would sign it.

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[1] We are grateful to John Wilmer of the New York University system for introducing us to the "petition" exercise. It comes originally from an article by Raiffe (1974).

(iii) Give three reasons for your decision.

We hope that this need to make a reasoned decision at the outset will engage both the cognitive and affective dimension of students' thinking and set a framework of personal involvement and meaning for the whole exercise.

A Petition Addressed to the Prime Minister of Australia

We, the undersigned citizens of Australia, are among the fortunate third of mankind who have enough food to eat. We do not suffer from malnourishment nor have many of our people experienced the pangs of hunger that persistently haunt most of the other two-thirds of the world's population.

In 1974 we applauded the Government's initiative in supporting a World Food Conference - held in Rome in November of that year - and noted that our delegation advocated increased food aid and food security for the less-developed world. Today, however, famine, starvation, and hunger still cast an ever increasing shadow over the lives of most of the people in the world.

We feel that Australia as one of the major industrial countries of the world and major powers in the world, has in its power the ability to make a major contribution to solving the world's food problem. We, therefore, favour an increase in our food production, the building of a world food security system (as promised in Rome) and a more generous policy in giving food aid. A portion of our agricultural production should be set aside immediately by the Government as the basis of a World Food Bank.

Moreover to help achieve this, we are willing to pay ten percent extra in tax provided your government will put this money into a special development fund.

We appreciate that action in Australia cannot feed the whole world, but what we do can make a difference. We should not continue to be an island of plenty on a planet which is becoming increasingly hungry.

Signed

....

Figure 1: "Sign the Petition If You Will, Please"
Give Three Reasons

2. Group students who decided alike into pairs. Each pair is to study its two lists and select the four most convincing arguments to justify their position. Additional information and resources should be provided at this point so that students

see their reasons in the light of those offered by other people. Students should be encouraged to incorporate this additional information in their selections where it is appropriate.

3. Join students into clusters of four when this is completed. Each cluster is to consist of one pair who signed the petition and one pair that did not. The clusters will each have two lists of the "four most convincing reasons" on the table before them. Each cluster then works as a team.
   (i) to examine these lists for factual validity and logical relevance to the issue, and
   (ii) to select the two most convincing arguments for both viewpoints.

   We have found that to ask students to evaluate the arguments of protagonists and to co-operate with them in a selection task is a successful way of getting them to consider viewpoints other than their own.
4. This next step is an important one. Ask each cluster to probe for the values that underlie these final four (two "for", two "against") arguments. Ask students to consider the implications of the reasons. For example, if one reason given for not signing the petition is "we should eradicate poverty and hunger in our own country first", have students think whether the principle behind the reason applies to other cases such as helping one's family first, rather than friends, helping friends before strangers, helping strangers who are socio-economically similar to you before you help those worse off then you, etc. Lines of reasoning such as this will help students discover the values that underlie their cognitive arguments and attitudes. Try to get students to focus on the fundamental questions of human dignity, justice, equality, individual rights and the dilemma of self interest Vs. wider benefits.
5. Bring the class back together and record the various sets of values on the blackboard. Classify and reorganize the list through discussion in order to avoid any repetition in the list. Discuss each one so that all students understand its meaning in relation to the petition issue and its implications if applied to other issues.
6. Ask students to individually and privately rank the listed values according to their own values or how important each is in their own lives. An alternative values clarification exercise

might be to ask students to classify the listed values into three categories of "I sincerely believe", "I do not believe" and "Sometimes (or in this case) I believe".

7. Ask students to read the petition again and to consider anew whether they would or would not sign it. Once again ask for three reasons for the decision.
8. Have students compare their original position and reasons with their new ones. Which students have changed their minds on the issue? Why? Who have not altered their positions and why not? Who have not altered their position but listed different reasons? Are the new lists of reasons now statements of values or still cognitive arguments as they probably were in the original lists? Debriefing along the lines of such questions will summarize the issue and its value implications for students.
9. Finally, ask students what they could do to act upon their positions. Community involvement and action are important steps in any values education programme. Without it, there is a danger that all previous work will be perceived as "school work" and the important links between school and society and thought and action not made in the minds of students. The level of involvement and action that teachers sponsor must, of course, be dependent upon the teacher, the milieu of the school and its community, and the prevailing ideology of the politico-educational system. Basically, there are four levels of involvement:
   (i) Ignore this stage of Values-Probing;
   (ii) Provide information to students on various community groups interested in the issue;
   (iii) Actively encourage students to join such groups and provide support to those who want to get more involved; and
   (iv) Make provision in class time for action learning related to the issues being studies. Guidelines for "safe" ways of doing this are provided in *Education for Citizen Action* (Newman, 1975).

Individual teachers will need to determine where they stand in relation to these four levels in this final step in Values-Probing.

CONCLUSION

Values-Probing is still in the "development" stage. We have outlined the reasons that led us to devise the strategy and the steps involved in using it as a comprehensive way of teaching values issues. It still has its problems, however. Many of these relate to the need to form pairs and clusters in a class. On one occasion an issue was used which did not divide the class sufficiently. There were six students who voted "yes" and twenty-seven who voted "no" on the issue of further high rise devleopment on the northern beaches of the Gold Coast. The pair - cluster pattern was re-arranged so that there was at least one "yes" student to five or six "no" students in the cluster and values-probing sections of the lesson. The minority students, however, were unable to cope with the weight of voices against their positions. Some felt threatened and defensive when the "materialistic" and "progress for progress sake" values they were espousing were questioned. This should not have happened and, so far, has not when the numbers in a cluster for each position have been even. Another problem we have encountered occurs in the values-probing stage. Most students seem able to see the values underlying arguments and the implications of them. On some occasions, however, students have experienced difficulty in "verbalizing" the values into a form that, on paper, resembles their thoughts.

However, we believe that Values-Probing does work despite these problems. The nine steps involved in Values-Probing do provide a strategy for teaching about a values issue in a comprehensive way. Values-Probing provides a varied and stimulating learning experience for students. It has a combination of individual, small group and whole class activities which, with the personal meaningfulness of making and justifying decisions on values questions, make Values-Probing an intrinsically motivating teaching approach capable of activating and maintaining the interest of most students. Most importantly, it does get students to consider the values underlying the general debate and attitudes towards an issue and to clarify their own values in relation to these. This view is supported by student teachers who have studied several issues via Values-Probing as a prelude to learning to use the technique themselves.

We conclude with statements from two such students. Their statements are jumbled but this is because they were not written as a formal evaluation of

Values-Probing. They were written in an examination in reply to a question on how the geography and geography teaching methods they had studied during the semester have helped them and could help students in understanding their use of and behaviour in the environment. Their statements, however, do provide a consumer's reaction to Values-Probing.

SUE: Participating in various Values-Probing exercises has made me aware of the fact that every person's behaviour is dictated by their individual values almost entirely. Previously, I did not realize the effect values had on people's decision-making behaviour.

KIM: Having to discover the value principles behind both sides of an issue has been useful in my interpretation of the environment. The values probing stage is the hardest but it does make you realize that what you think are good arguments can often spring from "undesirable" values. My values have affected the way I feel about the environment. However after listening to people who have different values to that of my own, I now feel that although I do not always agree with them, I am able to accept their positions.

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COPING WITH THE REAL WORLD: PROBLEMS OF EXAMINING THE GEOGRAPHY SYLLABUSES FOR THE HIGHER SCHOOL CERTIFICATE IN NEW SOUTH WALES

by MARY HALL and PETER IRWIN

Abstract. *The geography sullabuses for Years 11 and 12 in New South Wales detail their objectives under three discrete headings: knowledge, skills and attitudes. In reality, these objectives are complexly interrelated. This paper introduces the problems associated with the examining of these syllabuses which arise because of these interrelationships and because of the reality of the world in the 1980s. The problem of disparities in levels of development is seen as one of the great issues which must be faced by students, teachers, and examiners of geography in Years 11 and 12. The paper identifies a number of questions which need to be resolved by those involved in the teaching-learning-examining process at this level.*

In terms of its own syllabus objectives the New South Wales Higher School Certificate (H.S.C.) examination in geography is invalid if it does not test attitudes and values. It should test attitudes precisely because in the real world knowledge, skills and attitudes are interdependent aspects of the one world reality. The development of adequate learning and teaching about our complex environment itself depends on critical awareness that knowing the world is a complex task. The knowledge, skills and attitudes arising from the openness to value stances and resistances of teachers and students form a multiple feedback, learning dynamic. Students are at a crucial stage in their personal development in a rapidly changing world. How can they best cope with it?

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In the culture of the public service, as in other cultures, problems are often labelled 'difficult' or even 'insoluble' only because the labellers' minds are formed by the same processes which gave rise to the problems. Pessimism and scientism are the easy options.

As one wit remarked, the fastest way to change Mr. Chips is to change the examinations! But the prior point is to insist that geography teachers and examiners apply their geographical imaginations to develop the fullest sense of contemporary problems and processes. Currently this skill is needed to analyse and appreciate, for example, problems of deprivation at all scales, from local through state and national to international environments.

To cope with this one world it is crucial to see that knowledge, skills and attitudes are interrelated in everyday reality. To cope with the flood of information now becoming available about major and rather permanent aspects of the world environment, we all need to acquire new skills of judgement, not merely pay lip-service to the need for such skills. Attitudes must be accurately based in fact, and explicitly justifiable.

THE N.S.W HIGHER SCHOOL CERTIFICATE GEOGRAPHY SYLLABUSES

Two syllabuses are examined in New South Wales. We quote from the syllabus designated Geography : Australia and its neighbours.

> *The aims of this syllabus relate to the needs of students who look to the discipline for its interest and its contribution to their preparation for Australian citizenship. In pursuit of these aims, the syllabus seeks:*
>
> *(a) The acquisition and comprehension of pertinent, geographical knowledge relating to Australia and neighbouring countries;*
>
> *(b) the mastery of skills which assist the acquisition and comprehension of such knowledge;*
>
> *(c) the provision of opportunities for the fostering of attitudes which contribute to personal development; and*
>
> *(d) the stimulation of interest in place .*(1)

The ruling question of geography, why there? rightly prevails.

The syllabus objectives of stimulating interest in and knowledge about physical and cultural elements and processes in the environment are clearly interrelated with mapping, statistical and report-writing skills which are to "lead students to an appreciation of and concern for development problems" at both local and global scales, and students' "sense of social responsibility and ... their personal maturity" are to be fostered.(1)

KNOWING AND TEACHING ABOUT THE WORLD IS NOT A SIMPLE TASK

Knowledge, skills and attitudes in learning and teaching about the living world are interrelated both in people, in their interactions with each other, and in the objective reality of the world.

Good geography teaching may (but need not) begin at home : it certainly cannot stay there. In the 1980s teachers will have to face up to teaching about many objective situations of conflict in what will probably be an increasingly conflicted and national chauvinist world. Unless interrupted, all gaps between Haves and Have-nots are likely to widen.

We appreciate that information deficiencies, the laws inhibiting truly investigative journalism, and the social science tradition in Australia which appears to have been subject to impoverishing political manoeuvres earlier this century(2) have contributed, and still contribute, to the rigidities of various Australian education systems. But the best advances in social science, and the increasing skills in education for change in both the formal and informal sectors(3) enable us to face up to the insistence of Thompson that we comprehensively prepare students for change, including the aims of understanding political processes, and the preservation of human rights .... All peoples and governments have the responsibility to work to overcome the national and international economic disparities which underlie current reality.(4)

THE BASIC QUESTIONS IN GEOGRAPHY IN THE 1980s

Awareness of one's own mode of thought, and those of others, is crucial. Modes of thought are products of historical contexts,and the origins of the unmapped assumption of types of thought can be sought and explained. At issue and at stake, as the syllabus rightly indicates, is good citizenship.

In the 1970s the terms of debate about development issues became structural,and the issues are those of justice as equity. In approximately the same period, the two perennial questions in geography (1) Where? and (2) Why there? have been supplemented by the harder questions (3) Who is making the decisions? (4) Within what decisionmaking systems? and (5) For whose benefit are the decisions being taken?

In other words, Economic Man, the isolated individual optimiser in a "free" market, with perfect knowledge and conditions of perfect competition whose ethic did not question the existing distribution systems, has been declared, rightly, redundant at local, regional and international levels. The so-called iron law of comparative advantage is part of the same intellectual heritage. As Hollis rightly points out in what is still essentially an individualistic and not a collectively oriented study, economic theories have always been a matter of ethics.(5) Economics is far too important to society to be left to economists. What skills are needed to cope with the question For whose advantage?

In the near future, from sheer pressure of good quality evidence, we shall have to come to terms with the question which forms the title of the current Hunter Valley publication from community groups: *Who asked us?*

Who asked us? The question is now being asked internationally, generally with more force than in Australia, and it represents a necessary explication of the implications of the perception paradigm in geography in the early 1970s, and a necessary broadening of the terms of reference beyond the perceptions of very limited select groups in our sort of society. Are the views of the victims, those disadvantaged by our existing decisionmaking systems, taken into account along with those of the powers or decisionmakers, and those of various sorts of expert?

We are not condoning a priori romantic, so-called "identification" with "the disadvantaged", even by those with the best intentions. Some of this literature is vitalising, sometimes less than totally rigorous, possibly 'protesting too much', chiefly in-group and often having the impact of a B grade movie ... except that the analysis of the impact turns out to be verified *in situ*.

Much of this "alternative" literature is produced by people as well qualified as you and we, and it has to be taken seriously. Two basic temptations need to be guarded against - the temptations (i) to ignore or explain away what are for us non-traditional attempts at explaining the world as "really" emotive or symbolic utterances, and (ii) to confuse the current content of, for example, Western Establishment beliefs with universal criteria of truth and validity, and then proceed to use this current Western content as a yardstick for classifying all other beliefs.(6)

In the next section of this paper we outline the objective backdrop of geography teaching in the 1980s, the division of the world between Haves and Have-Nots, at local, regional and international scales. Skills, as the syllabus rightly points out, should not be taught in isolation. Actually they cannot be taught in isolation. From the many possible examples, the teacher chooses how to illustrate an understanding or skill. Attitudes to issues are necessarily involved.

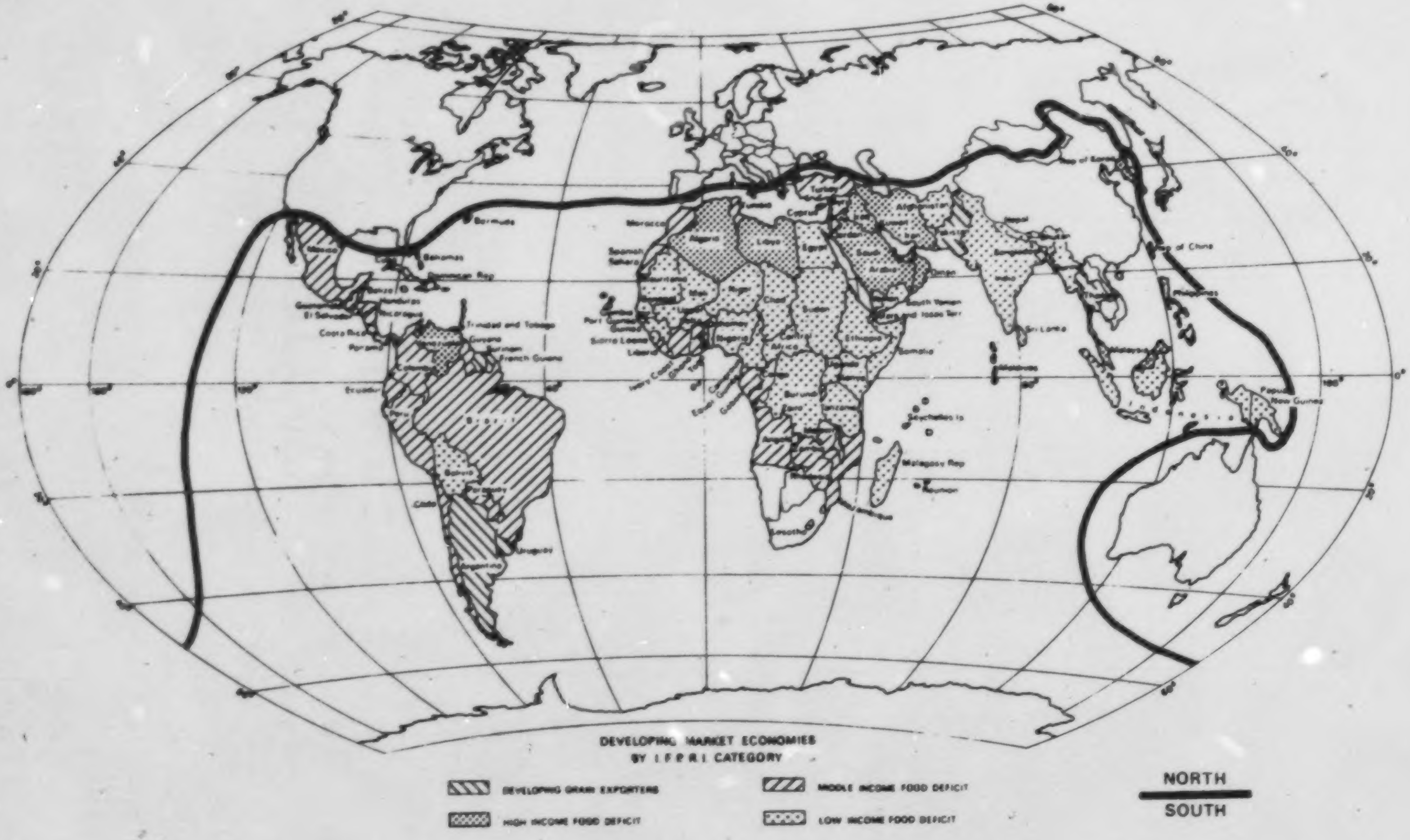
DEVELOPING MARKET ECONOMIES
BY I F P R I CATEGORY
▧ DEVELOPING GRAIN EXPORTERS
▨ MIDDLE INCOME FOOD DEFICIT
▩ HIGH INCOME FOOD DEFICIT
▒ LOW INCOME FOOD DEFICIT
NORTH
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Figure 1: EQUAL AREA PROJECTION TO SHOW THE NORTH-SOUTH DIVISION OF THE CONTEMPORARY WORLD.

COMPETENCE IN NORTH-SOUTH ISSUES : A BASIC TOUCHSTONE FOR THE 1980s

Where? Figure 1 uses an equal area projection to comment on the North-South division of the contemporary world which is and will continue to be the objective backdrop of the 1980s. It must qualify as a "broad pattern" or "recurring theme" of the New South Wales syllabus: both 'North' and 'South' countries are studied.

Why there? The main North-South issue in the 1980s will be the creation of a New International Economic Order to rectify the asymmetry in relations between the 130 "developing countries" and the 30 "developed" countries. The Director General for Development and International Economic Cooperation for the United Nations summarized the issues in the leading article of the September 1980 issue of *Scientific American.*(7) The asymmetry is evident in relative access of the two groups of countries to raw materials, markets, credit, science and technology. By this stage in history a restructured and properly functioning world economy is the necessary environment for growth in everyone's interests, particularly the interests of the poor who constitute more than half of mankind.

Important resources In its *Report on world development, 1980*, The World Bank estimates that 780 million people, concentrated chiefly - but not exclusively - in the poverty belts of Asia and Africa are living in absolute poverty. This is described as "a condition of life so characterized by malnutrition, illiteracy and disease as to be beneath any reasonable definition of human decency". At their best estimate, the number of absolutely poor people may be reduced to 700 million by 1990. If present well-documented trends continue uninterrupted, the number of absolutely poor people will increase.

One new and important resource in this respect is the Report of the Brandt 1980 Commission's investigation into North-South issues(8), in particular into the urgent problems of inequality in the world, and into the failure of its economic system. The United Nations Division of Public Information's booklet, *Towards a World Economy that Works*(9) their *Development Issues Papers*, FAO's *Ideas and Action* and UNDP's *Development Forum Papers*, are also important sources. These documents are increasingly including the reliable evidence, which comes mainly from non-government organizations, of groups of people in various parts of the world taking greater charge of their own lives, often in the face of massive oppression.

THE UNITED NATIONS SPECIAL SESSION ON DEVELOPMENT ISSUES,1980

The major facts and trends in world poverty are uncontested, and chiefly on the initiative of the "developing" nations a Special Session of the United Nations General Assembly was convened in August, 1980, at which one of us was present as a nongovernment member of the Australian delegation.

This 11th Special Session had three main aims:

(1) to assess progress on the establishment of the New International Economic Order called for in 1974;

(2) to devise an International Development Stragety for the 3rd Development Decade, 1981-1990;

(3) to agree on the agenda, the procedures, and a time frame for the Global Negotiations on improved economic cooperation for development.

All the right words about increasing justice and equity in the New International Economic Order exist on paper,but little progress has been made.

A new International Development Strategy for 1981-1900 has been agreed to, but at the time of writing it has not been formally adopted. Therefore we await the formal reservations of member nations which will give some indication of their real intent to implement the rather modest policy measures of the Strategy.

The round of Global Negotiations in 1981 on concrete ways in which trade, fiscal, monetary, energy, food, and raw materials 'development' topics could be pursued as interrelated issues, against specific time-targets, will bring to international attention the harder questions (4) Who decides? In which decision-making systems? and (5) Who asked us? Geography teachers, among others, should be singularly qualified to help shape the debate in the widest possible community. Governments are constrained by their interpretation of voter-interest in questions. The matters are too urgent and important to be left to governments. The Global Negotiations should be monitored.

THE BRANDT COMMISSION RECOMMENDATIONS

The Commission's recommendations for coping with "the dangerous future" and with hardships (pp. 269, 273) are based on marketeering economics; that is, they are not at all 'radical'. The members of the international commission, coming from different but moderate points of the political spectrum, agreed on a set of initiatives necessary for the survival of mankind. They listed the major tasks for the 1980s and 1990s as follows:

(1) giving priority to the needs of the poorest countries and regions, in particular, discriminating in favour of the poverty belts of Asia and Africa;

(2) the abolition of hunger through the abolition of poverty (there is enough food in the world to feed everyone);

(3) commodity price stabilization, increased local processing and more effective access to markets;

(4) lowering protectionist barriers against Third World industrial products;

(5) devising international codes of conduct and effective national laws to ensure the broader sharing of technology, to control restrictive business practices and to provide a framework for the activities of transnational corporations;

(6) reform of the international monetary system, in particular new approaches to development finance and to increasing decisionmaking power for the developing countries.

In addition an Emergency Program was drawn up for the period 1980-85. The four elements are interlocking - one will not succeed independently of the other three. They are:

(1) large-scale transfer of resources to developing countries;

(2) an international energy strategy;

(3) a global food programme;

(4) a start on some major reforms in the international monetary system.

One cannot NOT have a personal attitude to any or all of these recommendations.

THE TWO BASIC SIDES IN THE WORLD DEBATE

Basically there were two sides in the discussions in the United Nations. One was "Group B" consisting of all the highly industrialized countries, including Australia. The opposition side was Group of 77("G77"), which, with the admission of Zimbabwe into the United Nations, comprised 120 less developed countries. The EEC and White Commonwealth were obvious mini-blocs. OPEC lay very low, as did those with complaints against OPEC in the interests of G77 hardline solidarity.

What the two sides meant by "interdependence" and "equity" rarely came to the surface. There was agreement about the existence of increasing gaps between the rich and the poor countries, and the equally horrifying increasing gaps between the haves and the have-nots within countries. Further, there are, of course, deplorable implementation gaps. But there was virtually no urgency in the face of massive human need. Even though there had been more than a year of Preparatory Committee work for the Special Session, there seemed to have been little consideration of the substance of G77 arguments. Atomistic, fragmented policy making by Group B was geared to 'efficiency' of the existing economic institutions, as a virtually unquestionable neo-classical economic good. Three main issues blocked progress in reaching agreement:

(1) The role of energy. Was the IDS to encourage conservation, stabilization of supplies and prices, as the rich countries would like, or was it to encourage the search for new sources of energy?

(2) In the area of international monetary system reform was G77 to be given greater participation in the decision-making structures of the World Bank and other international financial institutions?

(3) The lack of commitment of the rich countries to official development assistance.

For example, the United States and Japan claimed major difficulties in meeting the International Development Strategy targets and time-frames because their economies are so big, or growing so quickly that they cannot cope with increasing development assistance. Budgetary constraints, especially in the advanced countries, have also become (approximately) a New Absolute.

Even though Group B basically intended not to facilitate any package deal demanded by G77 in what G77 perceive as the inter-related areas of trade, raw materials availability and pricing, energy, development, money and finance within specified time-frames, some important new elements appear in the International Development Strategy. They include the recognition of:

(1) the need for structural change in the world economy with effective participation by the developing counntries;

(2) the role of women in the whole development process;

(3) the need for collective self-reliance among developing countries;

(4) the critical and deteriorating situation in the Least Developed Countries; and

(5) the need for education on North-South issues in both developed and developing countries.

The link between reduced spending on armaments and higher standard of living in North and South was also included in the strategy, though less than forcibly debated.

In the context of massive existing overkill, the most buoyant sector of the world economy is the arms business. One pointer towards the solubility of social development problems could be that an annual reduction of only 10 per cent in military spending at 1979 prices would provide US $42 000 million per annum. According to

Sivard, this annual sum, the equivalent of about two-thirds of one percent of the World's Gross Product in 1976, could at 1979 prices provide an international programme for clean air + safe water for all within a decade + primary health care facilities and personnel in rural and poor areas + family planning and maternal health services + development of renewable energy sources + job training programs for young people + research and development for labour-intensive, low-cost technology + primary schools and teacher training in the Third World + direct food aid for the hungry + a literacy drive emphasizing skills for women + protective vaccines for all children + development aid for subsistence farmers in the Third World + a global program to eradicate malaria.(10)

All major development problems are highly complex structural problems, that is, problems of social relations.

Sivard's example is presented as a stimulus to discussion and action, rather than as an organized program. The problems are difficult, but not insoluble. As we stated on page 2, pessimism can be the easy option; students should be made aware of alternatives.

REGIONAL DEVELOPMENT ISSUES

Regional responses to the five basic questions cannot be developed here. It can however be noted that a regional workshop of justice-oriented development educators meeting in Tokyo in 1979 perceived the common concern of the Western Pacific Rim as

(1) problems of poverty due to unequal distribution of wealth and power;
(2) the exploitation of minorities;
(3) the low status of women;
(4) the growing power in some countries of foreign companies and foreign governments;
(5) the neglect of rural areas in favour of the cities;
(6) increasing suppression of dissent by authoritarian governments;
(7) an increasing swell of human rights violations throughout the region (and that, of course, includes Australia);
(8) consumerism;
(9) the negative effects of tourism;
(10) the increasing militarization affecting different parts of the region, and
(11) cut-throat competition among Asian countries to attract manufacturing by developing a new international division of cheap labour.

These problems were seen as complexly interdependent.

Raising the same five questions about the causes of poverty in Australia, produces comparable structural answers. The Poverty Inquiry rightly indicated that poverty is not just a personal attribute : it arises out of the organization of a society. Hollingworth concludes that

> the causes of poverty are precipitated more by problems in the organisation and structures of society than by individuals themselves. Which of us, faced with similar handicapping circumstances, would have fared any better? Most poor people in Australia today, whether men or women, married, separated or single, young or old, Aboriginal or recently migrated, rural or city dwellers, healthy or sick, unemployable or of low-skill, are locked into a self-perpetuating interlocking cycle of problems and circumstances, from which it is almost impossible to escape.(11)

What we have tended to label 'Third World' problems are now coming inescapably closer to home.

THE MEANING OF 'ENVIRONMENT' AS MAN-LAND RELATIONSHIPS

Georgraphers have much to contribute towards deepening the Australian understanding of the environment to explicitly include its value systems. Interest in, and concern for, the physical environment is, of course, a good thing. But it is crucial for more people to come to a confident understanding of the wider social environment which determines so much of the real quality of everyday life. There is still much pioneering to be done in terms of quality of life.

It is important to be as objective as possible about the economic systems operating, the legal system, the values, and the myths which control the quality of life. A basic task is to make explicit the conflict between stated values and the values implicit in social, political, economic and even physical arrangements. As Dwyer indicated, myths persist, in particular the vision of Australian society as guaranteeing everyone a "fair go" dies very hard. Two years later, Hollingworth still needed to insist on a better understanding of poverty in Australia. "It may be less comfortable, but it is more illuminating to examine the structural causes of poverty rather than focussing on the inadequacies of people. Our social mechanisms do not favour all people equally. They offer advantages to some and serious disadvantages to others" at the basic level of security and well-being.

For some students this lack of basic security and well-being must be an everyday lived reality. All have attitudes to all the above problems. Can we justify our attitudes?

SOME EXPLANATIONS ARE BETTER THAN OTHERS

One problem to be addressed squarely is the conflict in interpretation that occurs even among observers who admit the same set of basic facts. One useful rule of the thumb is that all arguments consist of intellectual PLUS emotional PLUS volitional elements. While this is an inadequate touchstone for discriminating among explanations, it does at least make us aware of the crucial significance of self-awareness, without which anyone lacks even cognitive control of his/her environment. Bad "dialogue" can proceed with no regard for the content or truth-value of the judgements being made, or examined. People rarely choose to look at evidence and arguments from others point of view because we each tend to be (more, or less, consciously) committed to the truth and importance of our own view over against most, if not all others. Assumptions can come to function like logical truths, and we tend to invoke some professionally "legitimizing" defence of the status quo. Professional dialogue tends to be only apparently open-ended rather than really so, because the speakers do not share valuations of the commonly acknowledged or acknowledged facts which are at issue. We consciously or unconsciously rank the data of experience, neglect, emphasize, discard some as irrelvant, or regard them as significant. Can we do other than articulate and maintain existing interpretations or valuations, or can we examine and justify those interpretations or valuations?

The question, 'what is truth?' is too often surrounded by a pseudosophisticated cynicism. The better question is, How can we know what is the case, and why it is so? We are simply not free narcissistically to create reality nor to believe what we want to : these are symptoms of profound self-estrangement or alienation. Personal maturity depends on facing truth, and some explanations do coincide more closely with the fullest sense of problems than others. The belief that the earth is flat was once an acceptable explanation. It has given way to the belief that the earth is a geoid. The point is that whatever anyone may prefer to believe(and there still exists a Flat Earth Society) as far as we know the earlier explanation is false,and the later one is a close approximation to the truth. Therefore the later one is the better explanation.

TO TEACH NORTH-SOUTH ISSUES, OR NOT TO TEACH THEM?

Students' knowledge, skills and attitudes in the 1980s will be lived out, inter alia , in the context of three main types of conflict, which qualify as Recurring Themes entailed by the N.S.W. syllabus. They are

(1) How can the needs of the poor take priority over the wants of the rich or of the Australian self-styled 'middle-income' groups?
(2) How can the freedom of the dominated take priority over the liberty of the powerful?
(3) How can the participation of marginalized people take priority over the preservation of the status quo which excludes them(12).

It will become clearer that knowledge, skills and attitudes in learning and teaching about the living world are interrelated both in people as individuals in their interactions with each other, and in the objective reality.

It ought already to be a more common conviction than it is that no one can be neutral, that no action is apolitical, that fence-sitting is not being neutral but is itself action, in the same way that not to decide involves actually deciding.

One cannot be neutral about North-South issues. Why are students not opting to answer examination questions on such Recurring Themes? Are they really too hard to cope with?

COPING WITH VALUE-CLARIFICATION

Most of our choices of teaching topics have ethical ramifications, if we look hard enough. An ethical issue is 'relevant' if it is one that any thinking person must face. On North-South issues the basic facts are clear and accepted by both sides. Is there any argument to help clarify attitudes to these questions?

Singer (1979) formally outlines one argument as follows:
(1) If we can prevent something bad without sacrificing anything of comparable significance, we ought to do so.
(2) Absolute poverty is bad.
(3) We can prevent some absolute poverty without sacrificing anything of comparable moral significance, therefore
(4) We ought to prevent some absolute poverty.

The first and third premises can be accepted by people who hold a variety of ethical positions. The second is unlikely to be challenged.

The third premise is more controversial, but it is true for most people living in industrialized countries on any defensible view of what is morally significant. Our affluence, even though we tend to think of ourselves as 'average' or middle-income people by local or by world standards, means that we have income we can dispose of without giving up the basic necessities of life. Where this is so, we can choose to prevent some absolute poverty. Since any absolute poverty is bad (not merely the global total), both the second and third premises are vindicated. How much we consider ourselves obliged to give up will depend on what we consider to be of comparable moral significance to the poverty we could prevent. Singer's list of touchstones is not exhaustive nor geared to students. But perhaps quite early in the 1980s some of them may be choosing to indulge in any or all of expensive wardrobes, sophisticated stereo-systems, a second car, overseas holidays, a larger house(13). By what criteria will they evaluate the moral significance of their allocation of their resources?

Objections to the arguments of preventability are likely to be of five main types. (1) If we are to assist at all, we instinctively prefer to assist those closest to us, e.g. families, the poor in one's own country before those in distant places. However the hard question is not what we usually do but what we ought to do. It is hard to see that distance or community membership makes a crucial difference to our obligations. With deteriorating economic conditions in the advanced countries causing increasing suffering (for example, from unemployment) this question will need sensitive handling but it cannot be avoided. Absolute poverty is virtually limited to poor nations. Students need to know whether their attitudes are well-informed. Singer argues that (2) the right to private property argument leaves too much to chance to be an acceptable ethical view, and (3) that the lifeboat-ethics of triage rules out in advance several types of fact or probable outcomes; for example, e.g. it flounders in a world which does produce enough to feed its inhabitants. Leaving it to the government (4) is often used as a reason against giving overseas aid, but not as a reason for being politically active. He might also have added that there are very serious constraints on the geographical areas in which governments can operate on a government-to-government basis, not to mention the speed at which they may work. The fifth objection is that his argument, for example, for tithing one's income in the context of living in a global community (by analogy with traditional tithing for the care of the poor in a local community) sets too heroic a standard.

In the nature of the case, there is not much evidence to go by. But students should articulate and justify their positions. Attitudes must conform with the empirical realities of which we are becoming increasingly aware. The teachers' task is the provision of new and shared experiences in which the need for new insight would be commonly felt.

Compared with their peers in some countries, Australian teachers have freedom to lead. Objections may be made to local examples, of course, as too near the bone. In which case, as one sage in curriculum development suggested, choose an example from interstate!

The 1970s have seen great advances in theory, and in solving development problems which are reducible to and susceptible to technological fixes. They have also shown up some limitations of trying to apply the solutions of reducible problems to more complex structural problems. For example, the high-yielding varieties of grains have not solved the problems of malnutrition even locally in many well-documented instances (14).

Teachers have to help make visible the invisible structures which express and concretize decisionmaking powers. They ought to teach towards finding solutions, not merely about the problems. In many cases there may not be one clear answer to problems. Risks may need to be considered, the criteria for "improvement" in a situation may be hard to identify, and the component parts of a solution may even contradict each other in some respects. For example, participatory decisionmaking in the interests of peoples' self-reliance may prolong suffering in the short-term at least. What attitude is one to adopt? Why so?

AN AUSTRALIAN VALUES-CLARIFICATION EXERCISE FOR THE 1980s

All H.S.C. students will soon be voters and some may already be taxpayers. They will have attitudes to North-South patterns and issues. What do they think should be Australia's attitude to these issues?

At the recent United Nations Special Session Australia expressed interest in genuine and urgent economic development depending on the complex range of factors elaborated in the new International Development Strategy (I.D.S.). We do not yet know what specific reservations Australia will make to the agreed text of the I.D.S. But we do know that holding that the recent record of the world economy shows (sic) that the world economic system is basically adequate for all countries not merely flies in the face of the evidence but also conflicts with the expressed interest in finding urgent solutions to the world's development problems.

Australian policy is in conflict with most of the very modest and moderate recommendations of the Brandt Report (supra) ranging from less well-known monetary and trade policies to the very easily identifiable area of overseas aid. Table 8 of Appendix 8 of the 1980 Budget paper, for instance, is grandiosely headed 'Growth of Australian Aid'. In fact it shows clear decline in per capita G.N.P.

official development assistance over the decade 1970-79.

In fact, six of the eight Recurring Themes of the syllabus should be explicitly studied and tested in North-South context, namely the impact of the West, cultural diversity and ethnic minorities, economic development, political tensions, Asian-Australian relations, the use of natural resources.

ARE NEW SKILLS NEEDED?WHEN?

Coping with reality in a mature way entails acquiring 'hard' information. This may not be easy, but that in itself is a learning about reality through which students can grow. The Information Branches of the Australian Development Assistance Bureau and of the Departments of Foreign Affairs, Trade and Treasury are the most obvious sources of government policy information on North-South issues.

In 1981, for instance, students could monitor the progress of the Global Negotiations on new and concrete forms of international economic cooperation which were launched by the recent United Nations Special Session. Are government decisionmakers trying to close gaps, merely trying to bridge them, or doggedly preserving the status quo which reinforces the gaps? For whose benefit?

Since the governments of the industrialized countries will be in general reluctantly involved in these Global Negotiations, students will need to seek out non-government sources. It seems unlikely that there will be good media coverage of the Negotiations : the issues are said to be too complex to be of general interest. Are they also too threatening, perhaps? A well-informed fortnightly bulletin will however be available from the Nongovernment Global Negotiations Information Project at the United Nations in New York. Also the U.N. Conference on Least Developed Countries will meet in Paris in March, the Brandt Summit for Survival in Mexico City in June, and Commonwealth Heads of Government in Melbourne in September/October.

In 1984 governments will be due to review their performance in implementing the new International Development Stategy and related recommendations from the Global Negotiations conference. Will the patterns of economic development have changed? If so, Where? Why there? Who decided so? For whose benefit? Were those currently disadvantaged consulted in the decisionmaking process?

Coping with the real world and with the H.S.C. syllabus in geography in the 1980s will not be easy, but it is quite possible. Better informed attitudes to problems and possibilities for improvement depend not only on relevant knowledge and skills but also on openness to change on the part of students, teachers and examiners. If geography, like many sciences, is declining in popularity, if it is no longer self evidently a good thing, could it be at least partly because the big questions about everyday realities of the world are not being tackled appropriately?

EXTERNAL EXAMINATIONS AND THE CURRICULUM PROCESS

Assessment and evaluation are essential parts of the curriculum process. By assessment we mean the testing of the achievements of the students either by the teacher or by some body external to the classroom. This assessment may be either by informal classroom tests or by formal examinations. Evaluation refers to judgements which are made concerning the teaching/learning process as to whether or not the objectives of the curriculum are being achieved. With the move towards school-based curriculum, there is an increasing need for teachers to evaluate their teaching in the light of pupil learning even though various forms of external evaluation are practised. The current clamour for "accountability" is in reality an insistence that teachers evaluate their curriculums and the outcomes of those curriculums. Of course, this leaves unresolved the issue of what criteria are to constitute the basis of the evaluation.

The H.S.C. examination in New South Wales is conducted by a statutory body called the Board of Senior School Studies (the Board). Each year the Board arranges for the examination of 35 000 candidates in over 40 subjects each of which generally has three courses. The Board is responsible for the preparation of the syllabuses which are examined, the setting of examinations, the marking of the candidates' scripts, and the grading of the candidates both in individual subjects and in the examination as a whole.

The details of this exercise,which involves a great number of people and which costs a great deal of money to discharge,need not concern us here. The important points to note in this context are that it is an external examination based on syllabus prescribed by the Board and that it is a norm-referenced form of assessment. This means that the Board, through its examiners, does not measure the performance of the individual candidates against some arbitrary standard of achievement but the performance of each candidate is ranked against that of all the other candidates. This is a comparatively simple matter to do within subjects and courses but it does create many problems when it comes to comparing the performance of candidates in different courses and in different subjects because the candidatures in the different courses and subjects vary considerably.

Although the object of the examination is to assess the achievement of each candidate relative to that of all the other candidates, and this is what is upper-most in the minds of the examiners while they are grading the candidates' responses, the examination also allows the examiners to evaluate the syllabus and the teaching of the syllabus.

Whilst the Board is at pains to ensure that the comments on the examination refer only to the performance of the candidates and the way in which the performance of future candidates may be improved, there is no doubt that the comments are, in reality, addressed to teachers and, in our opinion, this is how the notes are read by teachers. For example, the examiners in the Geography Examination Committee Report for the H.S.C. examination in 1979 wrote on page 2:

> Attention [has been] drawn to the structure of the syllabus which requires candidates to study examples which are relevant to a particular topic. The purpose of these examples is to enable the candidate to deal with the real world and, by so doing, both deepen his/her understanding of a particular concept or process and see the relevance of geographical study to his/her being an informed and responsible citizen.
>
> The examples chosen should be such that they can achieve these purposes. To this end, clear-cut examples should be used, especially when concepts are being developed.

Although ostensibly addressed to future candidates, the comment is clearly meant for teachers who are being told in no uncertain terms that some of their teaching is inadequate. Similar statements occur throughout the Report and the Report can (and should) be read as a statement evaluating the teachers who prepared candidates for the examination.

It is more difficult to show how the examination serves as a means of evaluating the syllabus. Although the Syllabus Committee which prepares the syllabuses and the Examination Committee which sets the examination and supervises its grading are independent of each other, some, often all, of the members of the Examination Committee are also members of the Syllabus Committee. This is a direct result of the Board's policy regarding the composition of the Examination Committee. It ensures that the members of the Examination Committee are made aware of the evaluation which should be, and is, made of their examination papers by the Syllabus Committee members. Conversely, the Examination Committee members are in the best position to evaluate the extent to which the content of the syllabus allows teachers and students to fulfil the aims of the syllabus. In Geography, most of the impetus for syllabus revision has come from members of the Examination Committee.

The external examination has a marked effect on both what is taught and, to an an extent, how the subject matter is taught. Teachers preparing candidates for the examination are very quick to respond to the emphasis or the neglect of a topic by the examiners.

The Examination Committee for 1975, initiated a trend in the examination of geography which has been followed by succeeding committees. This trend was accepted by the Syllabus Committee and schools were notified by a Board circular in April 1976 that the Examination Committee, amongst other things, intended to "increase the range of skills tested". The important point is that this change was brought about without any change in the syllabus and the result has been a marked shift in emphasis in the examination from the knowledge to the skills objectives of the syllabus. Judging by the responses of candidates, teachers generally have responded to this initiative by the 1975 Examination Committee.

The emphasis on skills which is apparent in 1980 indicates how changes without having to change the syllabus can be wrought over a period of time in both what is taught and how it is taught by the actions of an Examination Committee endorsed by a Syllabus Committee. This point has relevance when we come to discuss the attitude objectives of the Geography syllabuses.

The discussion to this point has emphasized the role which the examination can play in influencing teaching in the schools. It must be stressed that there is a reverse process. The responses of candidates and the comments of teachers also serve to evaluate the examination. Examiners are made all-too-well aware of their shortcomings when weaknesses in the examination paper are revealed.

The final points we wish to emphasize relate to examination validity and examiner reliability. Examination validity refers to the need to ensure that the examination does, in fact, test what it is intended to test. For an examination to be valid it must test all major sections of the syllabus in such a way that the candiates' degree of mastery of each of these sections is revealed. If a significant part of the syllabus is neglected or if the questions on a particular section of the syllabus fail to differentiate the varying degrees of mastery of that section by the candidates, to the extent that the examination fails in either of these respects, it lacks validity.

The reliability of an examination refers to the extent to which the candidate is awarded a particular mark irrespective of when or by whom the response is marked. Examination reliability depends upon the skill and experience of the markers and upon the checks which are employed in the marking procedures. It is influenced by the type of questions which are set. So-called objective tests have a very high degree of reliability; structured, short answer questions also have a high degree of reliability. The lack of reliability is greatest in essay-type questions but even here some types of questions result in greater unreliability than others. The open-ended type of question which encourages a wide range of responses is likely to cause problems with reliability. Where, however, the question calls for an essentially straightforward, factual essay reliability generally poses no problems.

In practice the questions which test the knowledge and skills section of a syllabus present comparatively few problems. However, when the question allows, even encourages, the candidate to express and justify a particular point of view, unreliability is likely to occur for a variety of reasons. Quite often, this type of question encourages the candidate to write "off the top of his/her head". These often result in answers in which logical argument and regard for facts become lost in a welter of unsubstantiated assertions. Examiners frequently react quite differently to this type of answer. Examiners have to cope with complex reality in which attitudes are interrelated with knowledge and skills. Just as they expect the teachers and candidates to be familiar with the main arguments and to be aware of their biases so must the examiners be familiar with current arguments and be aware of their biases.

THE NEW SOUTH WALES EXPERIENCE

The discussion of the preceding section is intended to draw attention to some of the realities of the setting and marking of external examinations. We now want to consider the syllabuses in geography used in New South Wales and the examinations based on them in the light of the material presented in the opening sections of this paper.

There are two syllabuses for students of geography in Years 11 and 12. There is an external examination at the end of Year 12. For the immediate future, at least, it can be assumed that this examination will not be replaced by some form of internal assessment.

The syllabus which is studied by most is called *Geography : natural and human systems*. It was developed during the 1960s. It is essentially systematic in its approach and leans to a man/land paradigm. As we have mentioned, this syllabus has been revised both overtly by the syllabus committe and covertly by the examination committee.

This syllabus has well-defined objectives relating to knowledge, skills and attitudes. We do not wish to state them all, but the following are particularly relevant.

> Apply geographical principles to a critical appreciation and understanding of local and world affairs. (A skill objective)
> Demonstrate an interest in, and concern for, problems of the local area, the homeland, and other parts of the world. (An attitude objective)

It is probably a fair comment on the mix of questions set that the knowledge and skills objectives of this syllabus are adequately tested. Although the attitude objectives have not been ignored, they certainly have not received an emphasis equal to that given to the other two. In reality, all three are interrelated and to achieve examination validity all three should be tested.

It is pertinent in this context to quote from the 1979 Examiners' Comments on a question relating to shifting subsistence agriculture

> One of the aims of the geography course is to provide for 'the formulation of attitudes and values contributing to personal development'. Repeatedly candidates used such terms as 'primitive natives'. The use of the term 'primitive' in conjunction with human beings expresses a racist attitude which, whilst not penalized by the examiners, (our emphasis) is to be deplored. (page 7)

The second syllabus, entitled *Geography : Australia and its neighbours* was prepared in the late 1970s. (Its aims are stated in full on the second page of this paper.) It focuses upon the contribution of geography to personal development. The attitude objectives are expanded in a statement which states that study of the syllabus should

> lead students to an appreciation of, and concern for, development problems of the local region, the homeland, and other parts of the world; to foster in students a sense of social responsibility and so lead them to personal maturity.

The examiners have not shrunk from setting questions which provide students with the opportunity to display their attitudes as well as their skills and knowledge. Unfortunately, the great majority of candidates choose to avoid such questions.

PROBLEMS TO BE INVESTIGATED

The discussion of the reality and complexity of the world of the 1980s and of the geography syllabuses and their examination in New South Wales suggests a number of questions.

84

1. Are the examinations valid? Specifically, is due attention being paid to attitudes? If it is not, what steps can be taken to rectify this position and to ensure the validity of the examinations?
2. Can the reliability of the examination be maintained if attitudes are tested more than they are at present? The question here is whether or not examination validity is deliberately being sacrificed in the interests of reliability.
3. Does the syllabus content accord with the stated aims of the syllabus given the reality of the world of the 1980s? Does the content incorporate those topics which will lead to the personal growth and maturity of the students who follow it?
4. Are the syllabus and examination expectations realistic in terms of student development? The real world is complex and answers are not simple. However, we agree with Collis and Biggs (p.16) that 16-18 year old H.S.C. students should be able to hold their conclusions open or qualified so as to allow logically possible alternatives(15).

As we stated earlier, coping with the real world and with the H.S.C. syllabus and examinations in geography in the 1980s will not be easy but we consider it is quite possible.

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ACADEMIC ASPIRATIONS OF TERTIARY GEOGRAPHY STUDENTS

by ROHAN G. CLARK*

Abstract. Students' claims of not caring about failure were not supported by survey results, with the purpose of such claims apparently being to provide a cover against failure. Peer-group pressure not to work was not generally evident, although it probably represented a real pressure for between 5 and 20% of students. However, students' aspirations revealed a considerable amount of "satisficing", with most students aiming for a safe pass, rather than notability through higher academic achievement. Aspirations appeared to be related to the job market and teaching methods. Females and correspondence students both worked harder and wanted to work harder.

INTRODUCTION

The impetus for the present investigation was quite practical. Amongst the author's first-year Environmental Studies students at U.N.E., there appeared to be some peer-group pressure not to work. This took the form of taunts and jibes, and was linked with labels like "consh". Moreover, in informal discussions, some students said that they did not care whether they passed or failed. In a different course, some third-year students said that they did not want to work too hard. In that instance they had previously been in full-time employment, and regarded full-time studying as a break. Considering that the students could, presumably, be earning money elsewhere, their attitudes were fascinating. However it was unclear how widespread they were. Thus, the general question being addressed concerned students' academic goals, the amount of work they do, whether they work at full capacity, and some factors which might be related to these aspects.

RESEARCH DESIGN

Students were sampled from a number of courses. For each course, it was necessary to know the grade for which a student was aiming, the amount of work done, and the amount of work the student felt he should be doing in the course.

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The difference between the amount of work done, and the amount of work he felt should be done, provided a quantitative assessment of whether the student felt he was working as hard as he ought to be. It was also necessary to obtain information concerning factors which might influence aspirations and work intensity. The present discussion excludes variables related to the individual motivations of students, including such reasons for working as the desire to please one's family, or self-satisfaction. Also excluded were factors related to the way in which a course was taught. This left four groups of factors:

1. Observable information about the individual student. This included the proportion of the degree completed (since aspirations and work involvement might vary with tertiary experience and nearness to completion of the qualifications), age, sex and study habits (specifically, the proportion of time the student worked alone).

2. The individual and his interaction with other students. In particular, in order to assess whether peer-group pressure existed, it was necessary to know whether a student was prepared to seek help from the lecturer, and, if so, whether he cared if his course colleagues know of it. Also, did the student think that his course colleague would approve or disapprove of him working. In addition, type of accommodation was requested because, if any peer-group pressure existed, it might be expected to be stronger in a situation of commund living.

3. The extent to which a student interacted with the Geography Department. This was measured in terms of the proportion of the degree done within that discipline.

4. The final group of factors concerned the individual and his interaction with the "outside world", via the student's perception of job prospects on completion. The relevance of job prospects is that, if you do not expect to be able to get a job when you have finished studying, you might well find it difficult to keep working.

In order to make this aspect of the investigation more complete, the survey included a sample of Armidale College of Advanced Education (ACAE) students from the "contextual studies" stream, which was the closest to geography. Although these students were told merely that they were providing a control group, it was, in fact, desirable to include students from another institution to provide a comparison. This resulted in three types of student being included in the study, namely ACAE, U.N.E. internal and U.N.E. external students. External students, involving correspondence courses by distance teaching methods, now comprise almost two-thirds of U.N.E.'s total enrolment.

The above considerations provided the information to be requested, which is set out in Table 1. Because of the desirability of having a survey form which could be completed reasonably quickly, open-ended questions were avoided.

Table 2 contains response rates disaggregated by academic year and student category. The higher first-year, internal response rates were the result of a captive audience, whereas, for all other groups, the questionnaires were left after a brief introduction, and were returned at a later time. Discounting the unusually high first-year response rate, overall response rates were in the order of one-third.

TABLE 1: INFORMATION SOUGHT

1. Aspirations and work intensity.
    1.1 Grade aimed for
    1.2 Average number of non-contact hours worked, for this course
    1.3 Difference between perceived desirable and actual worked hours, for this course.

2. Factors affecting aspirations and work intensity
    2.1 Proportion of qualification completed
    2.2 Age
    2.3 Sex
    2.4 Proportion of time worked on one's own
    2.5 Perception of fellow students' approval
    2.6 Whether the student would seek help
    2.7 Whether the student cared if friends knew of their request for help.
    2.8 Accommodation type
    2.9 Proportion of qualification completed within the Geography Department
    2.10 Knowledge of employment chances
    2.11 Perception of employment chances
    2.12 Desired job.

ASPIRATIONS

Respondents were asked to name the grade they were aiming for in a particular course or unit. Over half of all students aimed for a credit mark (Table 3). About

TABLE 2: RESPONSE RATES (%) BY LEVEL OF COURSE BY TYPE OF STUDENT. (NO. OF RESPONDENTS IN BRACKETS).

	UNE Internal	UNE External	ACAE	Overall
1st Year	96	28	34	54
	(77)	(22)	(22)	(121)
2nd Year	39	30	29	31
	(31)	(24)	(21)	(76)
3rd Year	34	36	39	36
	(45)	(62)	(40)	(147)
Overall	52	32	35	39
	(153)	(108)	(83)	(344)

two-fifths aimed for a grade either side of a credit, namely, pass (21%) and distinction (22%). The remainder (6%) aimed for a high distinction. Remembering that the initial impetus for the investigation stemmed from some students claiming that they did not care whether they passed or failed, either the informal comments or the survey data must be less than accurate. I am inclined to believe the results of the survey, as claims to a lecturer of indifference to failure merely provide a cover against the eventuality of failing.

TABLE 3: ASPIRATION BY TYPE OF STUDENT.

	UNE Internal	UNE External	ACAE	Overall
HD	6	5	10	21
	3.9%	4.6%	12.0%	6.1%
	(4.2%)*	(2.1%)		
D	30	21	26	77
	19.6%	19.4%	31.3%	22.4%
	(11.0%)	(7.4%)		
C	91	53	31	175
	59.5%	49.1%	37.3%	50.9%
	(47.3%)	(42.0%)		

	UNE Internal	UNE External	ACAE	Overall
P	26 17.0% (24.3%)	29 26.9% (30.6%)	16 19.3%	71 20.6%
F	- - (13.2%)	- - (17.9%)	- -	- -
Total	153 100%	108 100%	83 100%	344 100%

* Actual course results, excluding first-year.

$$(\chi^2 (12) = 68.3 ; P < .05)$$

Aspirations differed significantly between the three student groups (Table 3). ACAE student provided a noticable larger proportion aiming for higher grades (12% as against 4%). Actual course results, excluding first-year, are given in parentheses for U.N.E. students. Overall, they suggest that more students aspire to excellent results than achieve than, and that internal students achieved better results than external students. Certainly, more U.N.E. students, especially internally (60% as against 49% externally), aspire to credits than ACAE students (37%). Moreover, more external students would be satisfied with a pass (27% as against less than 20%), one may guess due to the pressures of other demands on their time.

A further analysis considered changes in aspiration through time. A second stage to the survey was conducted at the end of the semester, with response rates again in the order of one-third. In general, I am less happy about the representativeness of this sample, but one result was so clear it is difficult to refute. As a course progresses, aspirations converge (Table 4).

An additional factor which possibly influences aspirations is the extent of a student's experience with tertiary study. In order to investigate this, respondents were further classified according to the proportion of their qualification completed (Table 5), as well as by the level of the course. The results for both variables were almost identical, and, overall, the relationship between aspiration and proportion of qualification completed was not significant. However, for ACAE students only, a significant relationship existed with aspirations fallin as a greater proportion of the qualification was completed.

TABLE 4: ASPIRATION BY CHANGE IN ASPIRATION

No. and direction of grades changed.

	-2	-1	0	1	2
HD	1	4	0	0	0
D	4	15	13	4	0
C	0	9	54	7	0
P	0	0	12	5	4
Total	5	28	79	16	4

(χ^2 (12) = 68.4 ; $P < .05$)

Aspirations did not vary with age, sex, or study habits (measured in terms of the proportion of study time spent on working on one's own). A, expected, external students experience more isolated working conditions, with 96% of external student's work being done alone, in comparison with 82% for internal and 75% for ACAE students. Thus, it appears that ACAE students generally work more in the company of others.

Turning to factors concerned with a student's involvement with other students respondents were asked whether they felt that their colleagues approved or disapproved of them working. In practice, the "don't know" category also meant "don' care", and for all students, this was the most common opinion (175 of 335 responden Although responses were not related to aspiration, interestingly, of those who had an opinion as to their colleagues' reactions, 94 expected a reaction of disapproval in comparison with 66 who expected approval.

It was considered possible that aspirations may be related to students' preparedness to seek help when in difficulties. Although this was not the case, there were, overall, 15% of students who said they would not seek help. Even discounting the 30% of external students, whose unwillingness to seek help may have been related to logistical problems, amongst students having face-to-face contact, the proportion was 10%. Wherever the fault lies, it is uncomfortable having as many as ten students in a hundred who will not seek help when in difficulties.

	UNE Internal			UNE External			ACAE		
	< 1/3	1/3 - < 2/3	2/3 +	< 1/3	1/3 - < 2/3	2/3 +	< 1/3	1/3 - < 2/3	2/3 +
HD	3 3.4%	3 7.9%	0 0%	2 4.4%	1 3.7%	2 5.6%	7 31.8%	2 8.7%	1 2.6%
D	16 18.4%	8 21.1%	6 21.4%	9 20.0%	7 25.9%	5 13.9%	6 27.3%	7 30.4%	13 34.2%
C	50 57.5%	22 57.9%	19 67.9%	21 46.7%	15 55.6%	17 47.2%	8 36.4%	11 47.8%	12 31.6%
P	18 20.7%	5 13.2%	3 10.7%	13 28.9%	4 14.8%	12 33.3%	1 4.5%	3 13.0%	12 31.6%
Total	87 100%	38 100%	28 100%	45 100%	27 109%	36 100%	22 100%	23 100%	38 100%
	$(\chi^2\ (6) = 4.9)$			$(\chi^2\ (6) = 3.7)$			$(\chi^2\ (6) = 17.3\ ;\ P < .05)$		

TABLE 5: ASPIRATION BY TYPE OF STUDENT BY % COMPLETED

A related issue was whether students cared if their friends knew of their request for help. Overall, fewer than 5% of students cared, and, although providing too few cases for statistical analysis, by inspection, there did not appear to be any relation with aspiration. Moreover, type of accommodation did not appear to be related to students' aspirations. Thus, no factor reflecting a student's interaction with other students was related to aspiration. These results indicate that peer-group pressure is not an important factor depressing aspirations. Few students recognized it as such, and it was not more prevalent in situations of closer living. Nevertheless, some is perceived to exist for probably 5 to 20% of students.

With regard to a student's course completed in the Department. ACAE students were excluded from this analysis as they do not study geography as such.

Factors related to a student's interaction with the non-academic world included knowledge and perception of employment chances, and desired job. Knowledge of employment hences was provided by dividing students into three categories:

1. Those who perceived themselves to have sufficient knowledge to estimate their employment chances;
2. Those who had investigated but still did not consider themselves able to rate their employment chances; and
3. Those who had not investigated (Table 6).

Of those who were prepared to rate their employment chances, their perception of how likely they were to get a job was not related to aspiration. The suspicion remains that the crucial distinction is between those who are aware of employment prospects and those who have not investigated (i.e., 1 and 3 versus 2 in Table 6).

Aspirations were related to the type of job sought on completion (Table 7). There were too few cases to investigate the influence of type of student, which was unfortunate in view of the strong overlap. For example, primary teaching largely reflected ACAE students' aspirations, while "no change" included external students only. Nevertheless, the type of job sought appears to be a factor related to different aspiration levels.

HOURS WORKED

A measure of the work involvement of students was provided by the number of hours they worked in the course for which they had given their desired grade. The

TABLE 6: ASPIRATION BY TYPE OF STUDENT BY KNOWLEDGE OF EMPLOYMENT CHANCES

	UNE Internal			UNE External			ACAE		
	1*	2	3	1	2	3	1	2	3
HD	5	1	0	3	0	2	8	0	2
	4.0%	5.9%	0%	4.2%	0%	40%	11.1%	0%	33.3%
D	22	4	4	13	4	0	23	1	2
	12.6%	23.5%	36.4%	18.3%	19.0%	0%	31.9%	20%	33.3%
C	79	8	4	38	10	1	26	3	2
	63.2%	47.1%	36.4%	53.5%	47.6%	20%	36.1%	60%	33.3%
P	19	4	3	17	7	2	15	1	0
	15.2%	23.5%	27.3%	23.9%	33.3%	40%	20.8%	20%	0%
Total	125	17	11	71	21	5	72	5	6
	100%	100%	100%	100%	100%	100%	100%	100%	100%
% of Row	81.7%	11.1%	7.2%	73.2%	29.6%	7.0%	86.7%	6.0%	7.3%

(χ^2 (6) = 5.6)   (χ^2 (6) = 15.8 ; $P < .05$)

*1. = Students who perceive themselves to have sufficient knowledge to estimate their employment chances (see Table 14).

2. = Students who have not investigated employment chances.

3. = Students who have investigated, but do not feel able to rate their employment chances.

The measure was an estimate by the students of the average number of hours worked, apart from face-to-face contact hours. Thus, external students would be expected to put in more time to compensate for the lack of contact hours. Table 8 establishes this to be the case.

	Primary Teaching	Sec. Tch.	Other Tch.	Research	Counselling/ Social wk.	Planning	Govt. Dept.	No change
HD	10 11.8%	0 0%	1 3.6%	2 10%	2 20%	1 1.9%	1 3.4%	1 2.6%
D	24 28.2%	6 42.9%	2 7.1%	6 30%	2 20%	12 23.1%	4 13.8%	9 23.7%
C	34 40.0%	8 57.1%	21 75.0%	10 50%	6 60%	32 61.5%	17 58.6%	15 39.5%
P	17 20.0%	0 0%	4 14.3%	2 10%	0 0%	7 13.5%	7 24.1%	13 34.2%
Total	85 100%	14 100%	28 100%	20 100%	10 100%	52 100%	29 100%	38 100%

(χ^2 (21) = 38.6 ; P < .05)

TABLE 7: ASPIRATION BY DESIRED JOB

TABLE 8: HOURS WORKED BY TYPE OF STUDENT BY ASPIRATION

Means	UNE Internal	UNE External	ACAE	Overall
HD	8.8	8.2	6.0	7.3
D	6.1	11.2	4.5	6.9
C	5.1	7.2	4.1	5.6
P	4.4	8.4	3.5	5.7
Overall	5.3	8.4	4.0	

ANALYSIS OF VARIANCE

Source	df	MS	F	P
Type of Student	2	328.6	20.2	<.05
Aspiration	3	84.4	5.2	<.05
Interaction	6	27.1	1.7	
Error	273	16.2		

Hours worked differed also by aspiration. This was expected, and a consistent pattern emerged for the two groups of students taught by conventional methods (i.e., internal and ACAE) (Table 8). However, the less consistent pattern of external students needs explanation. From subsequent discussions, I suspect the main cause is that external students are not certain of what is wanted. The first effect of this is that they work hard and would like to aim higher than they espouse; and the second effect is that there is some misdirected activity by those not so good at punting on what work to do. Moreover, with regard to students not being certain of what is expected of them, another part of the survey asked how important was the lack of knowledge of the lecturer's expectations in causing them to work. Aspiration was related to the importance attached to such lack of knowledge (Table 9).

TABLE 9: ASPIRATIONS BY LACK OF KNOWLEDGE OF LECTURER'S EXPECTATIONS FOR THE COURSE INVOLVING THE MOST WORK.

Importance of the lack of knowledge

	V. Imp.	Imp.	Intermediate	Unimp.	V. Unimp.
HD	4	1	3	7	2
	8.0%	2.1%	4.5%	10.4%	2.4%
D	7	14	12	18	17
	14.0%	29.2%	17.9%	26.9%	20.7%
C	33	24	34	32	36
	66.0%	50.0%	50.7%	47.8%	43.9%
P	6	9	18	10	27
	12.0%	18.8%	26.9%	14.9%	32.9%
Total	50	48	67	67	82
	100%	100%	100%	100%	100%

$(\chi^2\ (12) = 25.1\ ;\ P < .05)$

Relating hours worked to factors associated with the student himself, hours worked was not related to the proportion of the qualification completed, not to age, not to the proportion of time worked on one's own (P < .05). Furthermore, there was no significant sex defference in the overall means of hours worked (Table 10). However, the trend was inconsistent, so that U.N.E. internal females worked about the same as their male colleagues, external females worked slightly harder, while ACAE females worked considerably harder. More will be said on the topic of sex differences later.

With regard to factors concerning the student's interaction with other students, students' perceptions of their colleagues' approval or disapproval of their working did not influence their amount of work, nor did accommodating type or friends' knowledge of them seeking help them in difficulties. However, overall, those students less likely to ask for help are also likely to be working less hard (Table 11). In this instance, aspirations, preparedness to seek help and type of student all had a bearing on the average number of hours worked.

TABLE 10: HOURS WORKED BY TYPE OF STUDENT BY SEX

Means	UNE Internal	UNE External	ACAE	Overall
M	5.3	8.2	2.6	6.1
F	5.4	8.6	4.9	5.9

ANALYSIS OF VARIANCE

Source	df	MS	F	M
Type of Student	2	289.7	17.1	< .05
Sex	1	11.9	.7	
Interaction	2	52.6	3.1	< .05
Error	278	17.0		

TABLE 11: HOURS WORKED BY ASPIRATION BY WHETHER A STUDENT WOULD SEEK HELP BY TYPE OF STUDENT

	UNE Internal		UNE External		ACAE		Overall
	Y*	N	Y	N	Y	N	
HD	8.8	-	8.2	-	6.4	3.0	7.3
D	6.3	4.0	11.3	10.6	4.7	2.5	6.9
C	5.3	3.0	7.8	4.8	4.0	4.3	5.5
P	4.2	4.6	8.3	6.7	3.5	-	4.3
Overall	5.5	3.9	8.9	6.5	4.4	3.5	

Overall Yes = 6.1   No = 5.2

* Y = Yes, would seek help.
N = No, would not seek help.

ANALYSIS OF VARIANCE

Source	df	MS	F	P
Aspiration	3	81.2	5.0	< .05
Seek help	1	86.6	5.3	< .05
Type of Student	2	360.6	22.1	< .05
2 way interactions	11	20.0	1.2	
3 way interactions	3	4.9	.3	
Error	262	16.3		

In terms of a student's relations with the Department, those completing a larger proportion of their qualifications within the Geography Department tended to work harder ($< \frac{1}{3}$ = 5.8 hours ; $\frac{1}{3} - < \frac{2}{3}$ = 6.4 hours ; $\frac{2}{3} +$ = 7.5 hours), probably because it reflected their major interest. However, none of the factors reflecting the student's interaction with the non-academic world affected the amount of work done (i.e., knowledge or perception of employment chances, a desired job).

DIFFERENCE BETWEEN HOURS ACTUALLY WORKED AND HOURS PERCEIVED TO BE DESIRABLE

Another measure of the commitment of students to their studies was the extent to which they were working as hard as they felt they should be. For this purpose, respondents were asked, not only how many non-contact hours weekly did they put into this unit, but also how many hours should they put in. The difference between the two may be termed, for convenience, perceived desirable hours. Less reliance may be placed on this information than on either of the other two measures, largely because it requires greater subjective judgement by the student.

Nevertheless, there was a difference in the extent to which internal, external and ACAE students felt they were working to capacity, with external students feeling most strongly that they should put in more work (Table 12). Since

TABLE 12: PERCEIVED DESIRABLE HOURS BY TYPE OF STUDENT BY ASPIRATION

Means	UNE Internal	UNE External	ACAE	Overall
HD	.8	2.0	5.7	3.6
D	2.1	4.6	2.8	3.0
C	3.3	4.0	2.1	3.2
P	2.4	3.9	3.5	3.2
Overall	2.8	4.0	3.0	

ANALYSIS OF VARIANCE

Source	df	MS	F	P
Type of Student	2	33.8	3.0	< .05
Aspiration	3	2.0	.2	
Interaction	6	25.9	2.3	< .05
Error	273	11.2		

they in fact, put in the most non-contact hours (Table 8), it provides evidence of the conscientious attitude of external students. On the other hand, inconsistencies occur when the results are categorized by aspiration. U.N.E. students, especially internals, who are aiming for the top, are close to working as hard as they feel they ought to be, in contract with ACAE students aspiring to a high distinction.

Of all the other factors investigated, the only one related to whether the student was working to capacity was the sex of the dependent (Table 13). Overall, females felt they ought to be working harder, but the result was inconsistent across different types of student. Thus, ACAE females did not, in fact, feel so inclined to do extra work as their male colleagues, whereas U.N.E. females, and especially externals, felt the need to work harder. Also, these results need to be seen in conjunction with the results of hours worked (Table 10). U.N.E. internal males and females worked about equally hard, but the females felt more strongly that they should be doing more. On the other hand, ACAE females worked harder, but the males felt they should work harder. External females not only worked harder than their male counterparts, but also wanted to work considerably harder. Overall, females are consistently more conscientious than their male colleagues.

CONCLUSION

In terms of the original impetus for the study, virtually every student cares whether he passes or fails, and the present study has produced evidence that students do want to pass. However, there does appear to be a considerable degree of "satisficing". Furthermore, as a course progresses, most students feel themselves "pulled" towards a middle grade. In terms of a general education aim, such as the fullest possible development of each person as an individual, such satisficing and mediocrity are disturbing. Peer-group pressure did not appear to be a major course of lack of aspiration on work. Some "ockerism" (or, in other words, some adulation of crassness) does appear to exist, partly providing a cover against lack of achievement, but partly, also, representing a real pressure for a minority of students (probably between 5 and 20%). In addition, there appears to be a job-related factor influencing students' aspirations and work intensity. It is not cleear to what extent it is related to perceived job prospects, knowledge of job prospects, or the specific job being aimed for. The specification of the direction of causality awaits further investigation.

Turning to the amount of effort put in, those with higher aspirations work harder, as do those not knowing what the lecturer wants. In this case, the extra work possibly results from misdirected effort. Moreover, those not working as hard are less likely to approach the lecturer to find out what is wanted. Also, it seems that students work harder in the subject in which they are specialising. With regard to both the amount of work done and the degree to which students are working as hard as they feel they should be working, there appears to be a sex-related difference, in the general direction of females wanting to work harder.

Frequently in the present study, responses of internal and ACAE students were similar, but responses of external students differed to some degree. Overall, external students appear to work harder on their own, and to want to work harder than internal/ACAE students. They appear to suffer from a lack of knowledge of what is expected of them, presumably brought about by the inevitable lack of contact. Probably as a result, they hope for less.

TABLE 13: PERCEIVED DESIRABLE HOURS BY TYPE OF STUDENT BY SEX

Means	UNE Internal	UNE External	ACAE	Overall
M	2.5	2.9	3.9	2.8
F	3.1	5.6	2.8	3.5

ANALYSIS OF VARIANCE

Source	df	MS	F	P
Type of Student	2	45.0	4.1	< .05
Sex	1	50.6	4.6	< .05
Interaction	2	64.6	5.9	< .05
Error	278	11.0		

In practical terms, what might be done? Given that the sex difference appears a little difficult to exploit, there are three practical possibilities. Firstly, although the detailed process is unclear, it is possible that an approachable lecturer, who attempts to encourage students with difficulties to come for assistance, may motivate the student. However, this is uncertain, as it may merely raise students' hopes, since hours actually worked was not related to seeking help. Secondly, external students appear very likely to benefit from clear specification of what is expected, and the mode of approach most suitable. However, this may also be uncertain as one, albeit dangerous, teaching strategy may be to encourage students to work by deliberately creating uncertainty. Such an approach would not be likely to raise most student's aspirations. Thirdly, students who aim higher appear to differ in knowledge of the job market, and/or type of job desired. In this regard, the Department of Geography at the University of Queensland displays of Australia for jobs for geographers. Also, for the first time in 1980, that Department published "Job Opportunities for Geographers", a compilation of such newspaper advertisements by Jon East and David Wadley. However, the effect on teaching and students' performance of bringing the job market to the attention of undergraduates in this way has not been documented. It is this third avenue that the author intends to explore further.

Overall, the study has been worthwhile in that it has yielded answers to the questions which provided the initial impetus. Not surprisingly, it has raised more questions than it has answered, and in turn has pointed the way to further interesting lines of enquiry.

CHILDREN'S DEVELOPMENT OF COMPETENCE AND PERFORMANCE IN CARTOGRAPHIC LANGUAGE

by ROD GERBER*

Abstract. *This study considers cartographic communication from a semiotic viewpoint, especially in relation to the meaning children at the concrete level of map-reasoning give to cartographic signs. The study examines the children's development of competence and performance in cartographic language. It concludes that children do develop in their understanding and use of cartographic language from ages eight to fourteen; that this development varies according to different types of cartographic signs; and that there are important implications for curriculum developers and classroom teachers.*

Cartographic communication occurs when a cartographer and a map user respectively encode and decode a message via the medium of a map. This process of communication should be successful if both the cartographer and the map user are competent in the language used in the communication - cartographic language. Language, in this sense, is used to mean anything communicated by people, from ideas conveyed by words, numbers or graphics to emotions conveyed by gestures. Cartographic language is the variety of signs which are used to encode and decode the message on a map.

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One approach to cartographic language is the semiotic approach which considers any system of signs as a system of signification of meaning (Barthes, 1967:9). Within such a system it is possible to perform analytical operations leading from meanings towards elements and synthetical operations leading from elements to meanings.

> *This interpretation of the conception of a system equals the conception of a code.* (Ratajski, 1971:138)

Greniewski (1968:36) suggests that the categories of the cartographic code include:

(a) informative elements; and
(b) information.

Informative elements which denote syntactic features include:

(a) singular terms (information regarding the position of a given place using a reference system such as parallels of latitude and meridians of longitude);
(b) one-argument predicates (signs of various graphic shapes — circles or triangles); and
(c) relations of comparison which may be external or internal.

Internal relations include the relative location of places on a map. External relations may be of three types:

(i) a relation of denotation when the mutual positions of two places are proportionally the same on the map:
(ii) a relation of predication, e.g. when a small black rectangle denotes a factory or a circle denotes a town; and
(iii) a relation of reflection which determines the ratio of the concept of reality created by using the map to that reality.

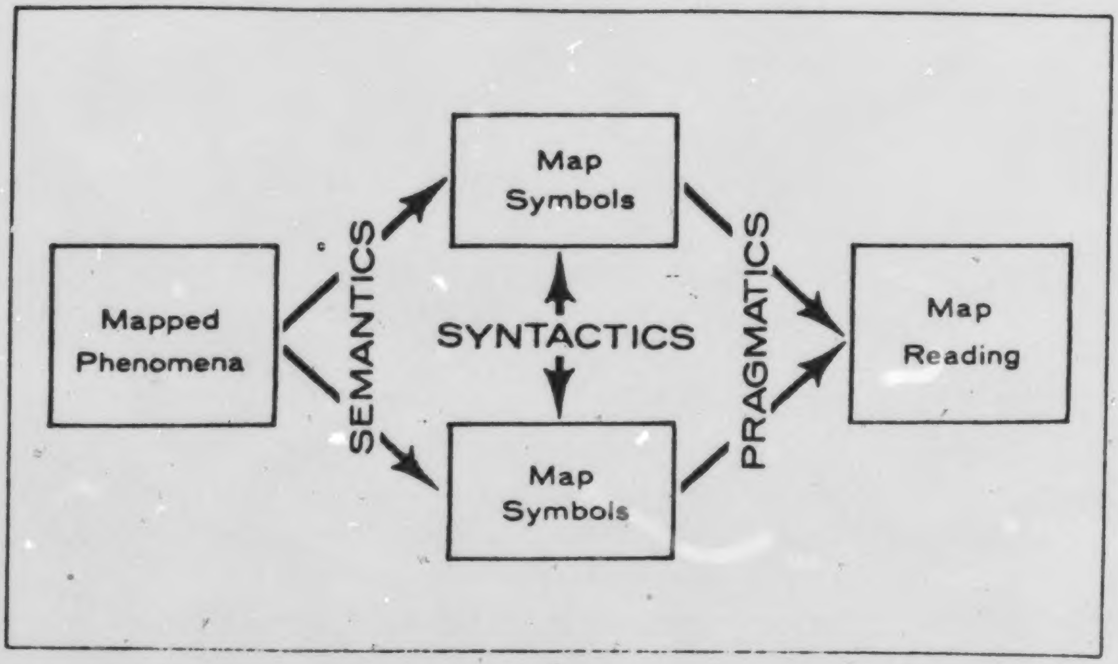
Information includes "simple information" and maps (the vehicles for communicating cartographic information).

There are three identifiable, overlapping parts to the semiotic approach — syntactics (the rules relating to the internal structure of the system of signs), semantics (the meaning of the signs or the relationship between signs and the concepts they represent), and pragmatics (the relationship of the language to the people who use it) (Cherry, 1957).

The semiotic viewpoint of cartographic language refers to three major divisions of cartographic processing:

(i) the study of the relation of map symbols to their referents;
(ii) the study of the relation of map symbols to one another; and
(iii) the study of the relation of map symbols to the people who use them — the cartographers and the map users (Muehrcke, 1972:35).

The relationship between the three strands of the semiotic viewpoint has been organised into a graphic structure by Muehrcke based on the theoretical statements of Morris (1938). This structure is presented in Figure 1. This study, whilst relating cartographic signs to one another and to their referents, focuses on the map user and his development of cartographic language. It highlights aspects of the semantics of cartographic language.



(after Morris, 1938 and Muehrcke, 1972)

Figure 1: STRUCTURE OF THE SEMIOTIC VIEWPOINT AS APPLIED TO CARTOGRAPHY

Most of the writing on cartographic language is about cartographic symbols. However, since orthophotomaps can now be classified as a legitimate map form, the signs on it may be classified as cartographic signs. Since photographs are representations of reality, the photographic details on an orthophotomap may be classified as a range of cartographic representations, just as abstract symbols are another form of cartographic representation. Therefore, one may argue that cartographic signs do not equal cartographic symbols. Also, it may be argued that cartographic signals do not equal cartographic symbols. The main thrust of this difference in terminology is to propose that cartographic signals differ from cartographic symbols, but that both are cartographic signs. Therefore, in general terms it is more inclusive to speak of cartographic signs.

Cartographic signals differ from cartographic symbols in the amount of understanding required by people as they use these signs. Furth (1968) clarifies this difference by stating that signals function as a stimulus substitute which elicits a reaction similar to the original stimulus, whereas symbols are signs that are produced by a person and they directly follow from or lead to an internal action of knowing. Traffic signs are signals in that a fixed one-to-one relationship exists between the sign and its meaning. A traffic sign for a pedestrian crossing has a clear singular meaning. The sign becomes symbolic when a person ascribes an arbitrary meaning to it, e.g. the conventional road sign for a pedestrian crossing could be varied to mean a railway crossing.

When this idea of signs consisting of signals and symbols is applied to cartographic language, it permits the inclusion of many of the signs on orthophotomaps as signals and the usual range of topographic and thematic signs as symbols. Most of the signs on orthophotomaps are signals because they are characterised by external form, i.e. any meaning that is acquired regarding the sign is derived from the look of the sign and not from any conceptual understanding. For example, the aerial representation of a clump of trees on an orthophotomap produces a textured effect which looks exactly like trees seen from above. There is a definite one-to-one correspondence, so that the perceiver need only to be able to identify the look of a clump of trees to make sense of this signal on an orthophotomap.

The example of trees may be extended to symbols by inserting the expectation of the perceiver deriving meaning from the symbol via understanding the substantive concept of "trees". If this concept is developed sufficiently it will encompass the different sub-divisions of t[illegible] normally encountered in the legend of topographic maps. Therefore, the symbol for a tree, however it is drawn, will provide a location on the map (and possibly areal extent), but the remainder of the meaning of that symbol rests in the perceiver's mind depending on his or her understanding of the concept "trees".

Since cartographic signs are representations of spatial phenomena they are to some degree removed from the actual referent. The link between the sign and the referent involves the concept of distance. For Werner and Kaplan (1963:40-51) the concept of distance involves not only the sign and the referent, but also the encoder (the cartographer) and the receiver (the map user). The development of signs (especially symbols) involves change in the four key elements:

(i) the encoder (cartographer) matures;
(ii) the receiver (map user) changes by developing a more objective view of the world;
(iii) referents become increasingly complex; and
(iv) the signs become increasingly conventional.

The changes from external to inner form by both referents and signs are integral in this development. The sensorimotor scheme relating to the external form of an object is closely linked to its signal-for-action character. Therefore, the cartographic signal for a house may appear as a greatly reduced view of the roof of the house with the shape of the house being the same as it is in reality. The inner form (the meaning the symbol expresses) of the cartographic symbol for a house is characterised by a reduction of egocentrism and idiosyncracy — the symbol for the house becomes an obscure black square.

Distancing of sign from referent in the external form is characterised by the decrease of tangible likeness, while the inner form of the referent becomes less bound to a concrete external form and develops into an invariant structure seen as an abstract symbol.

The concept of distance has been incorporated in several approaches which illustrate the nature of cartographic signs. Robinson and Petchenik (1976:61) refer to distancing as the distinction between

> *those marks that are visually completely arbitrary, and those that retain some graphic characteristic that can be visually or conceptually related to the referent.*

Consequently, they propose a linear continuum of map signs from "mimetic depiction" through to "arbitrary depiction". Mimetic signs are those symbols which bear resemblance to the referent, e.g. pictorial symbols such as a drawing of several trees from a side elevation to represent a forest. At the other end of the continuum, arbitrary symbols bear little resemblance to their referents, e.g. a cluster of green oval shapes to represent the extent of a mixed forest. Robinson and Petchenik (1976:62-63) extend this continuum to thematic symbols and to typography. In regard to thematic signs, e.g. population grouped by intervals, mimetic symbols consist of circles of proportional sizes whilst the comparable arbitrary symbols consist of variable shapes. For typography, mimetic presentation is evident in variations in size of the one typeface. Arbitrary symbolisation of typography consists of variable type size of different typefaces. Robinson and Petchenik proposed the above continuum to reduce the difficulties in classing symbols as either mimetic or arbitrary.

Muehrcke (1972:37) did the same with cartographic symbols by classifying them as natural, semi-natural and arbitrary. Natural symbols, e.g. a silhouette image of a skier or a fisherman in a boat, resemble an image of the phenomena depicted. Semi-natural symbols, e.g. a sinuous line representing a river or a dotted line representing a road, display intermediate level abstractions whilst generalising the essential characteristics of their referents. Arbitrary symbols display the highest level of abstraction to generalise their referents via line, point and area symbols, e.g. a triangle may represent a park or a dot may represent a railway station.

The ranges detailed by Muehrcke, Robinson and Petchenik, pertain only to cartographic symbols and make no allowance for cartographic signals. For example, the cartographic signal for a clump of trees on an orthophotomap is more realistic (i.e. has more external form) than the pictorial symbols of trees which a child draws on a map. Therefore, the range or continuum should start with cartographic signals rather than natural or mimetic, pictorial symbols, and continue through to abstract arbitrary symbols.

This continuum is illustrated in Figure 2 for the referent house. At the signal level, the house is drawn as a duplicate of the plan view of the house. At the ikonic/mimetic level, the house is represented as a pictorial symbol. However, at the abstract symbolic level, the house is presented as a small black square which bears little visible relationship to the house referent. The author suspects that for young children, up to the age of eight years, that there is a preliminary stage to this continuum — the idiosyncratic view — when children draw signs which have little rational meaning but which appear vaguely pictorial.

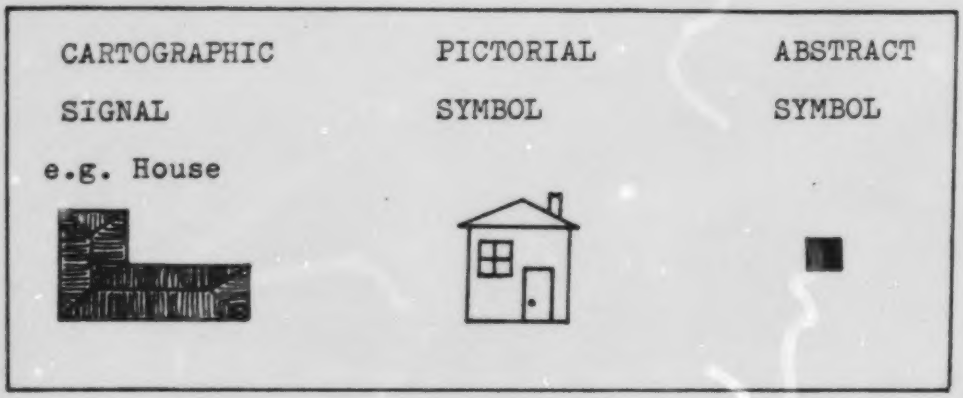


Figure 2: CONTINUUM OF CARTOGRAPHIC SIGNS USING THE SIGN FOR A HOUSE AS AN EXAMPLE

The study reported here investigates the development of competence and performance in cartographic language by 300 children at the concrete level of map-reasoning. The children were grouped into four blocks of seventy-five according to their map-reasoning score on the Salomon-Feldman map-reading test (Salomon and Feldman, 1969). The children in the lowest concrete level map-reasoning block had a mean age of 8.95 years. The mean ages increased regularly through to block 4 where it was 13.12 years.

An individual's competence in cartographic language is his ability to understand the meaning of cartographic signs. It consists of the identification of a sign by being able to draw it and the comprehension of the sign by:

(i) knowing the sign in context (i.e. on a map);
(ii) knowing the sign out of context (i.e. in isolation);
(iii) understanding the substantive concept represented by the sign; and
(iv) making inferences about the sign.

An individual's performance in cartographic language is his ability to use cartographic signs in map making. The link between an individual's competence and performance in cartographic language is that the individual's competence plus a range of individual attributes, e.g. map-reading ability, previous experience with maps, home environment and drawing ability, are important influences on the individual's development of performance in cartographic language.

The children in the study group undertook two activities — one testing their competence in cartographic language and the other testing their performance in cartographic language.

The test of children's competence in cartographic language was devised on the premise that the signs on the map and within its margins consist of:

(a) line, point and area signs presented in qualitative and quantitative forms;

(b) alphanumeric signs; and

(c) standard elements which are located around the margins of the map, e.g. scale and direction indicator.

Alphanumeric signs were not examined separately. They were subsumed in the questions relating to the other signs listed above. This test consists of three subtests: the first two sub-tests are concerned with the qualitative presentation of line, point and area signs, and standard elements, whilst the third subtest is concerned with the quantitative presentation of line, point and area signs.

The children's performance in cartographic language was measured by their ability to draw a map of their school grounds. Their maps were scored on the basis of Snyder, Feldman and La Rossa's manual for a Piaget-based map-drawing exercise (1975).

The analysis of data from the two activities were performed using the SPSS sub-program ONEWAY which computed a univariate analysis of variance followed by a Tukey HSD test for the purpose of multiple classification analysis. This means that if there are significant differences between group mean scores, one can determine which of these differences are the significant ones.

This study sought to disprove two null hypotheses:

1. *There is no difference between the mean performances of subjects in four map-reasoning levels for their competence in cartographic language.*
2. *There is no difference between the mean performances of subjects in four map-reasoning levels for their performance in cartographic langugae.*

HYPOTHESIS 1. *There is no difference between the mean performances of subjects in four map-reasoning levels for their competence in cartographic language.*

The children's scores on their competence in cartographic language are subdivided into:

(a) scores of identification and comprehension on standard elements (V_1 and V_2), qualitative line signs (V_3 and V_4), quantitative line signs (V_5 and V_6), qualitative point signs (V_7 and V_8), quantitative point signs (V_9 and V_{10}), qualitative area signs (V_{11} and V_{12}) and quantitative area signs (V_{13} and V_{14});

(b) sub-total scores on the identification of qualitative signs (V_{15}), the comprehension of qualitative signs (V_{16}), the identification of quantitative signs (V_{17}), the comprehension of quantitative signs (V_{18}), the identification of all signs (V_{19}) and the comprehension of all signs (V_{20}); and

(c) the total score of children's competence in cartographic language (V_{21}).

The mean scores and standard deviations for these variables are presented in Tables 1 and 2 respectively.

Table 1 indicates that, for all variables, the group means increase from block 1 through block 4. It also indicates that there is a gradual increase in the difference between the group means from block 1 through block 4 for V_1 (identification of standard elements), V_4 (comprehension of qualitative line signs), V_5 (identification of quantitative line signs), V_6 (comprehension of quantitative line signs), V_{11} (identification of qualitative area signs), V_{14} (comprehension of quantitative area signs), V_{15} (total identification of qualitative signs), V_{16} (total comprehension of qualitative signs) and V_{21} (grand total competence score). There are several variables for which the largest difference between group means is between blocks 2 and 3, followed by the difference between blocks 3 and 4. These are V_2 (comprehension of standard elements), V_8 (comprehension of qualitative point signs), V_9 (identification of quantitative point signs), V_{10} (comprehension of quantitative point signs), V_{12} (comprehension of qualitative area signs), V_{18} (total comprehension of quantitative signs), V_{19} (total identification of signs) and V_{20} (total comprehension of signs). Therefore, there is a general trend to larger group means and larger differences between each pair of group means from block 1 to block 4.

Table 1: MEANS OF CHILDREN'S SCORES ON THEIR COMPETENCE IN CARTOGRAPHIC LANGUAGE BY MAP-REASONING BLOCKS

BLOCKS	RAW SCORE MEANS											
	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}
1	2.84	9.88	5.95	10.94	1.42	5.36	5.20	10.81	2.19	6.40	2.84	9.88
2	3.36	12.98	6.93	11.92	1.70	6.49	5.69	12.58	2.35	8.37	3.36	12.98
3	4.26	17.53	7.22	15.41	2.36	8.85	7.08	16.83	3.04	10.89	4.27	17.53
4	5.60	21.24	7.60	19.78	3.07	12.27	7.37	20.09	3.27	13.12	5.60	21.24

BLOCKS	RAW SCORE MEANS								
	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{21}
1	5.95	10.95	1.41	5.36	5.20	10.81	2.18	6.40	2.89
2	6.93	11.92	1.70	6.49	5.69	12.59	2.34	8.37	3.95
3	7.23	15.41	2.36	8.85	7.08	16.83	3.04	10.89	5.20
4	7.60	19.78	3.07	12.27	7.37	20.09	3.27	13.12	6.59

Table 2: STANDARD DEVIATIONS OF CHILDREN'S SCORES ON THEIR COMPETENCE IN CARTOGRAPHIC LANGUAGE BY MAP-REASONING BLOCKS

BLOCKS	RAW SCORE STANDARD DEVIATIONS											
	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}
1	2.11	5.00	2.19	5.05	1.10	3.30	2.38	4.64	1.47	3.67	2.10	5.01
2	2.09	6.60	1.83	5.72	0.97	3.47	2.49	6.08	1.06	4.07	2.09	6.61
3	2.48	7.11	1.41	5.93	1.17	3.45	1.59	5.66	0.96	3.28	2.48	7.11
4	2.57	6.78	1.01	5.85	1.11	3.11	1.33	5.45	0.93	2.82	2.57	6.78

BLOCKS	RAW SCORE STANDARD DEVIATIONS								
	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{21}
1	2.19	5.05	1.10	3.30	2.38	4.63	1.14	3.67	2.14
2	1.83	5.72	0.97	3.47	2.49	6.08	1.05	4.07	2.44
3	1.41	5.93	1.17	3.46	1.59	5.66	0.96	3.28	2.33
4	1.01	5.85	1.10	3.11	1.33	5.45	0.93	2.82	1.87

Table 3 presents the results of the univariate analysis of variance for Hypothesis 1.

The univariate F tests in Table 3 indicate that there is a highly significant variation among the group means for all measured aspects of the children's competence in cartographic language when the children are blocked according to their map-reasoning level. This is so for their competence in the identification and comprehension of line, point and area cartographic signs and standard elements. The criterion reference — the Salomon-Feldman map-reasoning test — incorporates the Piagetian concept of development. Consistent significant variance among the group means is essential if this developmental characteristic is evident in the children's competence in cartographic language. Since the differences reported in Table 3 are so highly significant, there is evidence of development in the children's competence across the four map-reasoning blocks.

All of the variables in Table 3 display high F ratios with p values less than 0.0001. The Tukey method of multiple comparisons was used to determine which groups are responsible for the significant F ratios on all variables. The Tukey method was chosen because all blocks were the same size and the investigator was interested only in the differences between pairs of the four map-reasoning blocks (Hopkins and Chadbourn, 1967:407-412).

There were six pairs of means to be compared among the four map-reasoning levels:
$\overline{X}_4 - \overline{X}_1$, $\overline{X}_4 - \overline{X}_2$, $\overline{X}_4 - \overline{X}_3$, $\overline{X}_3 - \overline{X}_2$, $\overline{X}_3 - \overline{X}_1$, and $\overline{X}_2 - \overline{X}_1$, where $\overline{X}_i$ corresponds to the mean for map-reasoning block i. The significance of the mean differences among the four map-reasoning levels is presented graphically in Figure 3.

Figure 3 indicates that for children's comprehension of cartographic signs, the group mean scores for children in blocks 1 and 2 are similar, but significantly different from those of children in blocks 3 and 4. The scores of children in blocks 3 and 4 are significantly different from each other. Each of the four blocks is significantly different from the three other blocks on the children's comprehension of standard elements, qualitative point signs and qualitative area signs.

Figure 3 also indicates that each of the four blocks is significantly different

Table 3: UNIVARIATE ANALYSIS OF VARIANCE USING 21 VARIABLES OF COMPETENCE IN CARTOGRAPHIC LANGUAGE

VARIABLE	df	F	p
V_1	3	20.28	.0000**
V_2	3	45.33	.0000**
V_3	3	13.48	.0000**
V_4	3	37.64	.0000**
V_5	3	34.15	.0000**
V_6	3	62.64	.0000**
V_7	3	20.61	.0000**
V_8	3	43.74	.0000**
V_9	3	19.44	.0000**
V_{10}	3	52.76	.0000**
V_{11}	3	20.28	.0000**
V_{12}	3	45.33	.0000**
V_{13}	3	13.48	.0000**
V_{14}	3	37.64	.0000**
V_{15}	3	34.15	.0000**
V_{16}	3	62.64	.0000**
V_{17}	3	20.61	.0000**
V_{18}	3	43.74	.0000**
V_{19}	3	19.44	.0000**
V_{20}	3	52.76	.0000**
V_{21}	3	39.14	.0000**

** significant at 0.0001 level

MAP REASONING BLOCK	COMPETENCE IN CARTOGRAPHIC LANGUAGE																				
	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{21}
1	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘
2	▥		▥	⁘	⁘	⁘	⁘	⁘	⁘	▥	▒	▥	▥	⁘	⁘	⁘	⁘	⁘	⁘	▥	▥
3	▤	▤	▥	▤	▤	▤	▤	▤	▤	▤	▤	▤	▥	▤	▤	▤	▤	▤	▤	▤	▤
4	▦	▦	▥	▦	▦	▦	▤	▦	▤	▦	▦	▦	▥	▦	▦	▦	▤	▦	▤	▦	▦

///

Homogeneous Groups=Blocks which are significantly different from other blocks.

— = Divisions between homogeneous groups. ⁘ =Blocks homogeneous with Block 1

▥ = Blocks homogeneous with Block 2. ▤ = Blocks homogeneous with Block 3.

▦ = Blocks homogeneous with Block 4. ▒ = Transition Area(overlap between homogeneous groups).

V_1=Identif. of Standard Elements;V_2=Comprehension of Standard Elements;V_3= Identif. of Qual.Line Signs: V_4=Comp. of Qual. Line Signs;V_5=Identif. of Quant. Line Signs;V_6=Comp. of Quant. Line Signs;V_7= Identif. of Qual. Point Signs;V_8= Comp. of Qual. Point Signs;V_9= Identif. of Quant. Point Signs; V_{10}= Comp. of Quant. Point Signs;V_{11}= Identif. of Qual. Area Signs;V_{12}= Comp. of Qual. Area Signs; V_{13}= Identif. of Quant. Area Signs;V_{14}= Comp.of Quant. Area Signs;V_{15}= Total Identif. of Qual. Signs;V_{16}= Total Comp. of Qual. Signs;V_{17}= Total Identif. of Quant. Signs;V_{18}= Total Comp. of Quant. Signs;V_{19}= Total Identif. of Signs;V_{20}= Total Comp. of Signs;V_{21}= Grand Total Competence Score.

Figure 3: SUMMARY OF HOMOGENEOUS GROUPS AMONG BLOCKS OF SUBJECTS ON THEIR COMPETENCE IN CARTOGRAPHIC LANGUAGE

from the other blocks on the children's total score on competence in cartographic language.

These results are consistent with Piagetian notions of development. They suggest that the sequence of development of children's competence in cartographic language across the concrete level of map-reasoning is from block 1 through to block 4. Similarities between children in blocks 1 and 2 are noted.

HYPOTHESIS 2. *There is no difference between the mean performances of subjects in four map-reasoning levels for their performance in cartographic language.*

The children's group mean scores and the standard deviations of their performance in cartographic language (V_1) are presented in Table 4. The children's performances were measured by two expert raters who scored the language the children used in their free-recall sketch maps of their school grounds.

Table 4: MEANS AND STANDARD DEVIATIONS OF CHILDREN'S SCORES ON THEIR PERFORMANCE IN CARTOGRAPHIC LANGUAGE

BLOCK	RAW SCORE MEANS V_1	RAW SCORE STANDARD DEVIATIONS V_1
1	2.89	1.18
2	3.43	1.07
3	4.00	0.79
4	4.35	0.76

Table 4 indicates that for the children's performance in cartographic language, the group means increase from block 1 through block 4. It also indicates that the difference between each pair of group means increases from block 1 to block 4.

Table 5 presents the results of the univariate analysis of variance for hypothesis 2.

Table 5: UNIVARIATE ANALYSIS OF VARIANCE USING CHILDREN'S PERFORMANCE IN CARTOGRAPHIC LANGUAGE

VARIABLE	df	F	p
V_1	3	32.975	.0000**

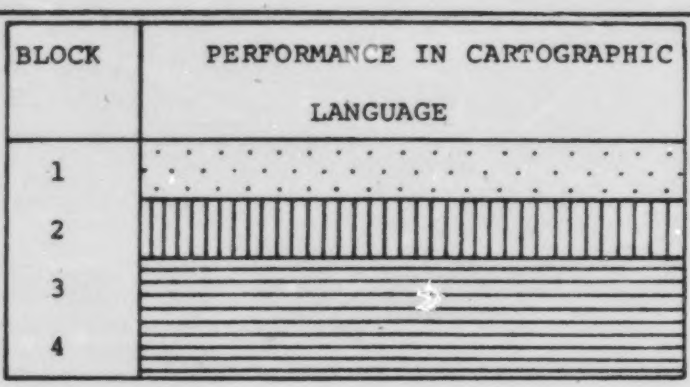
** significant at 0.0001 level

The univariate F test reported in Table 5 indicates that there is a highly significant variation among the group means for all measured aspects of performance in cartographic language for children at the concrete level of map-reasoning.

Since the variance in the group mean scores of the children's performance in cartographic language produced a high F ratio with a p value less than 0.0001, the Tukey method of multiple comparisons was used to determine which groups are responsible for the significant F ratio on variable V_1 (performance in cartographic language). The significance of the mean differences among the four map-reasoning levels is presented graphically in Figure 4. It indicates that for the group means on children's performance in cartographic language, children in blocks 1 and 2 perform with significant difference from each other and from the children in blocks 3 and 4. However, children in blocks 3 and 4 are not significantly different from each other with respect to their performance in cartographic language.

These results suggest that there is a sequence of development in children's performance in cartographic language across the four concrete map-reasoning blocks. The sequence is from block 1 through blocks 3 and 4.

The maps which the children drew of their school grounds illustrate the above pattern of performance in cartographic language. Salomon and Feldman (1969) stated that the concrete level of map-reasoning is surpassed only by the formal level of map-reasoning. Therefore, children at the concrete level of map-reasoning were expected to display some ability in using cartographic language.



Homogeneous Groups = Blocks which are significantly different from other blocks. ▭ =Divisions between homogeneous groups.

⁘ =Blocks homogeneous with Block 1.

▥ =Blocks homogeneous with Block 2.

▤ =Blocks homogeneous with Block 3.

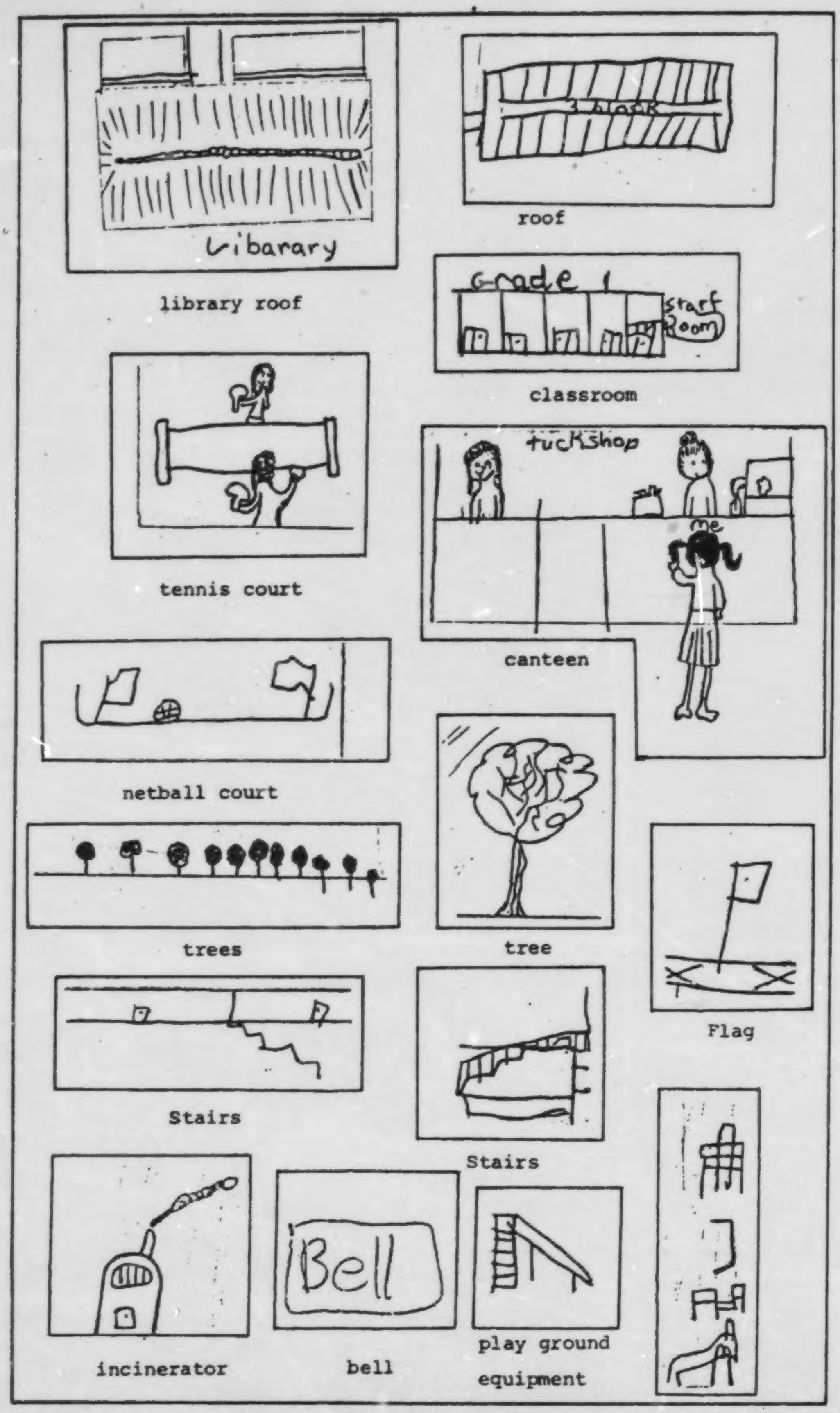
▦ =Blocks homogeneous with Block 4.

Figure 4: SUMMARY OF HOMOGENEOUS GROUPS AMONG BLOCKS OF SUBJECTS ON PERFORMANCE IN CARTOGRAPHIC LANGUAGE

Figures 5 to 8 illustrate the use of cartographic language in each of the four concrete map-reasoning blocks. The distinctive pattern in the children's representation of objects on a map is described below.

The cartographic language used by children in block 1 is sampled in Figure 5. The samples indicate that the cartographic signs used by these children consist of a blend of signals and mimetic symbols. Cartographic signals are evident when the children draw buildings from side or plan views. The side view of the school building is an attempted duplication of that view. Therefore, doors and stairs are inserted carefully on the school building. Where children draw buildings from a plan view, they attempt to duplicate the plan view of the roof, rather than to represent it. Therefore, they draw the corrugated iron together with its ridge capping.

Mimetic symbols, which retain the form of their referents, but which are


Libarary
3 block
Grade 1
staff Room
tuckshop
me
Bell

library roof

roof

classroom

tennis court

canteen

netball court

trees

tree

Flag

Stairs

Stairs

incinerator

bell

play ground equipment

Figure 5: SELECTED CARTOGRAPHIC SIGNS DRAWN BY CHILDREN IN MAP-REASONING BLOCK 1

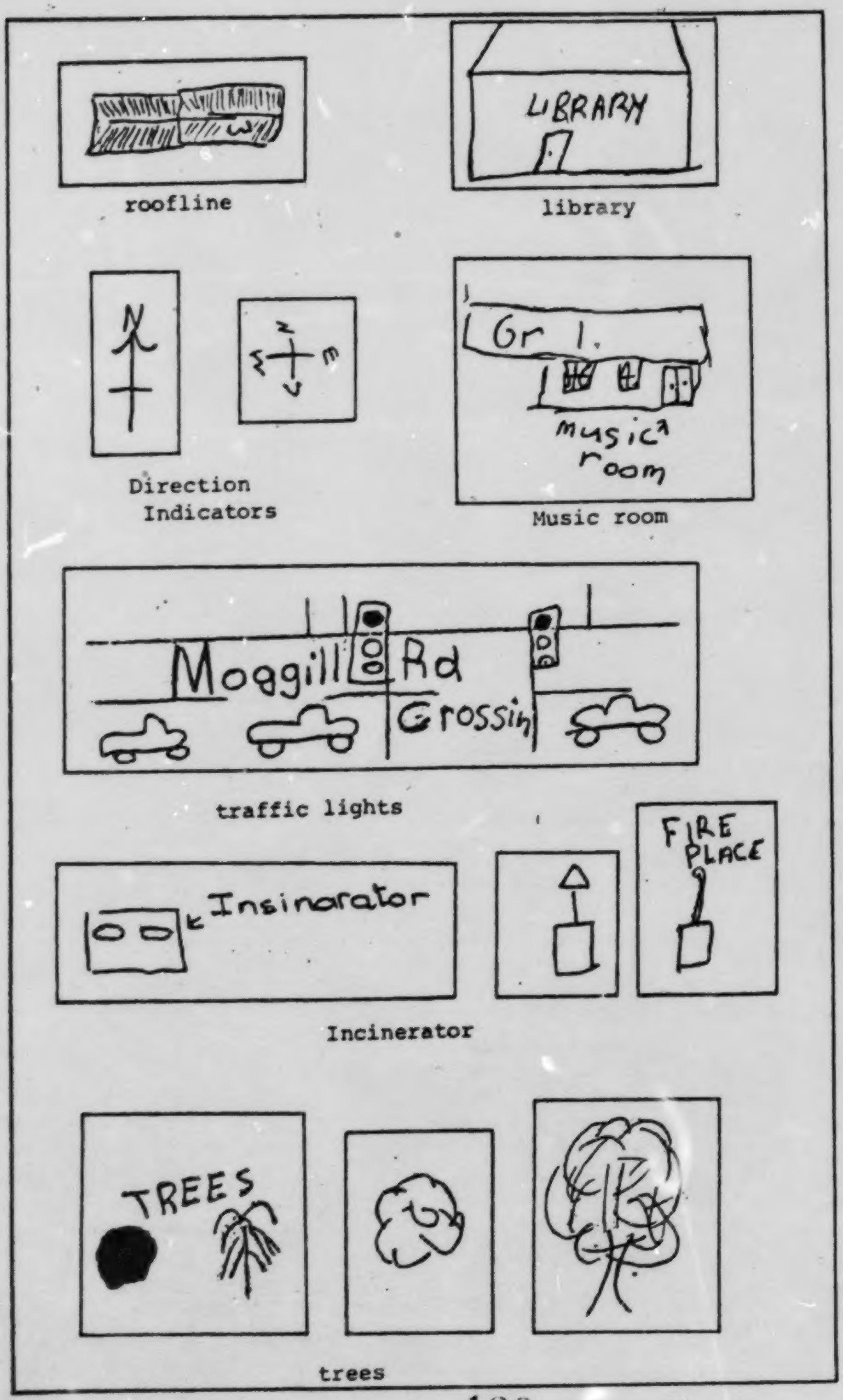

roofline
LIBRARY
library
N
N
E
S
W
Direction Indicators
Gr 1.
music room
Music room
Moggill Rd
Crossin
traffic lights
Insinorator
FIRE PLACE
Incinerator
TREES
trees

Figure 6: SELECTED CARTOGRAPHIC SIGNS DRAWN BY CHILDREN IN MAP-REASONING BLOCK 2

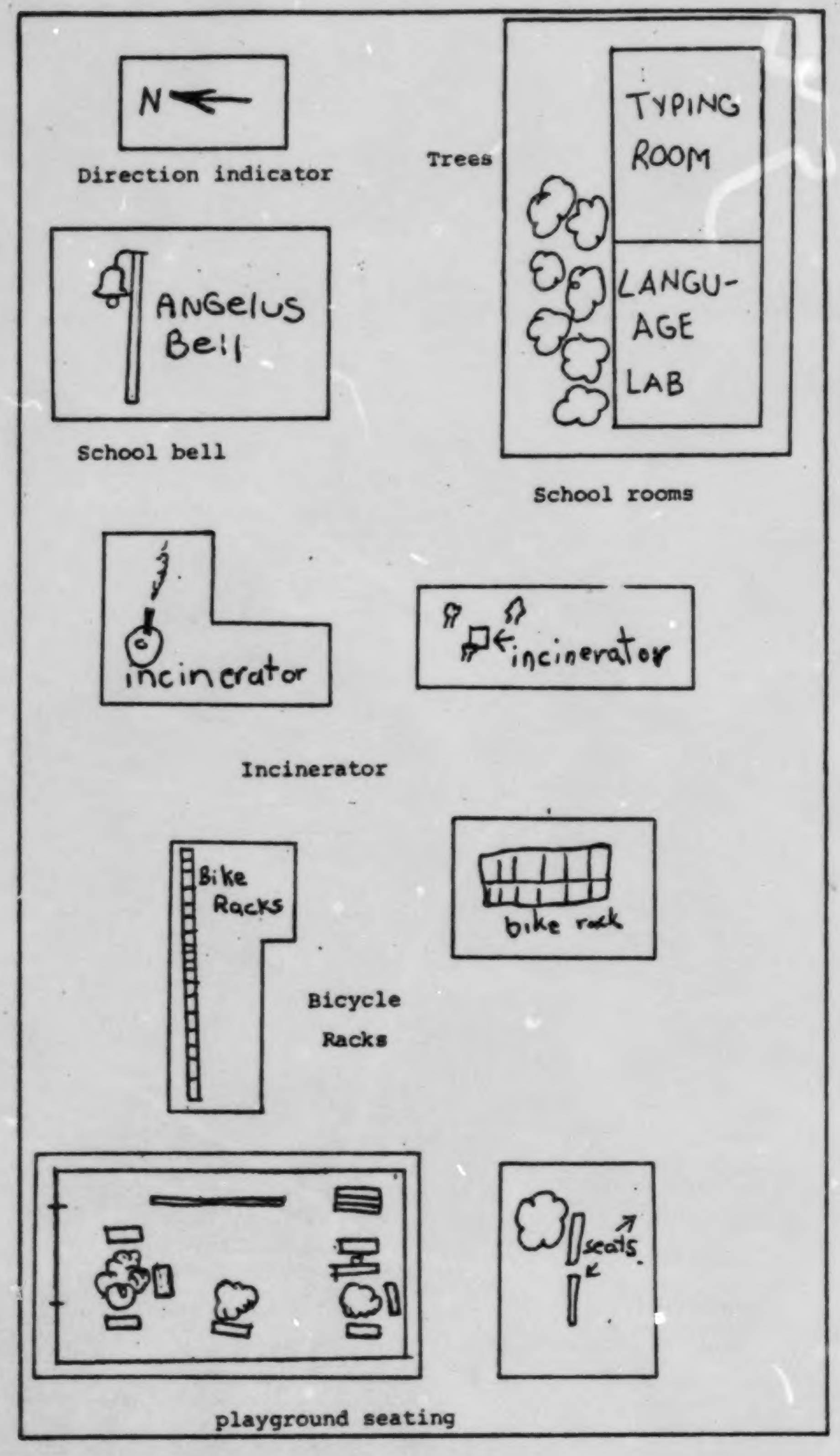

N
Direction indicator
ANGeIUS Bell
School bell
Trees
TYPING ROOM
LANGU-AGE LAB
School rooms
incinerator
incinerator
Incinerator
Bike Racks
bike rack
Bicycle Racks
seats
playground seating

Figure 7: SELECTED CARTOGRAPHIC SIGNS DRAWN BY CHILDREN IN MAP-REASONING BLOCK 3

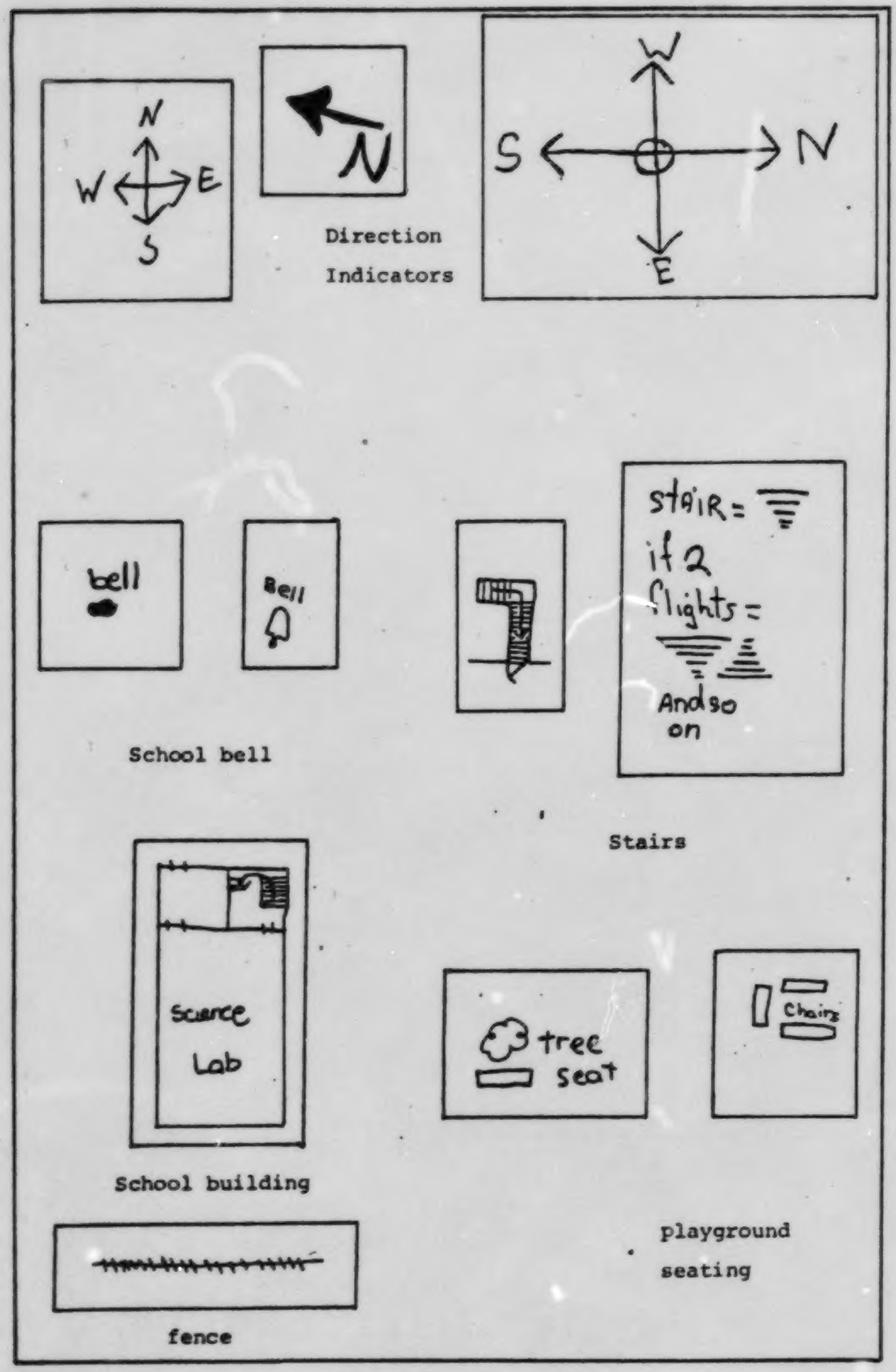

N
W
E
S
N
W
S
N
E
Direction Indicators
bell
Bell
School bell
stair =
if 2 flights =
And so on
Stairs
Science Lab
School building
tree
seat
Chairs
playground seating
fence

Figure 8: SELECTED CARTOGRAPHIC SIGNS DRAWN BY CHILDREN IN MAP-REASONING BLOCK 4

distanced to a small extent from them, are drawn to represent key objects. The symbol for the school flag closely represents a flag flapping in the breeze. Trees, tennis nets, slippery slides, the incinerator and basketball goal posts, are other objects represented by mimetic symbols.

Children in block 1 do not use a legend. They prefer to verbalise on the map, e.g. the location of the school bell. They verbalise at the expense of the clarity of the map.

Children in block 2 make a similar use of cartographic language to those in block 1. However, there is evidence of the children starting to insert increased distance between the sign and the referent. Children in block 2 also begin to use a legend and a direction indicator. The cartographic language used by children in block 2 is sampled in Figure 6. It reveals that some children in block 2 still draw cartographic signals to depict buildings. Whereas children in block 1 insert details of doors and stairs on their drawings of buildings, those in block 2 insert more detail, e.g. windows.

Children in block 2 present a larger range of mimetic symbols on their maps. Trees, incinerator, bell and playground equipment are represented as well as gates and fences. These children also begin to use a legend and a direction indicator. The signs presented in the legend are mainly mimetic. However, the children still verbalise on their maps, even when they use a legend. Therefore, the maps of children in blocks 1 and 2 are cluttered with names.

Children in block 3 generally draw less cluttered maps than those in the lower map reasoning blocks. This is because of the decrease in the amount of verbalising on the maps.

The signs on the maps of children in block 3 are all symbols of sorts. (See Figure 7.) Mimetic symbols are present in the signs for the school bell, trees and school gates. This type of sign constitutes a minority of the signs used on the maps. An increasing number of the signs are distant from their referents. Buildings are drawn as geometric shapes (squares or rectangles) and are usually identified by label, e.g. typing room. The increasing abstractness of signs is best illustrated by referring to particular objects: the school fence is represented somewhat like a railway line; the incinerator is a small square; trees are classified as plants or vegetation and represented by wiggly circular symbols; and playground euqipment is represented by small rectangular shapes.

Children in block 3 make no more use of the direction indicator than those in block 2. They do make greater use of a legend. This is so for line, point and area signs. They also use colour, in a limited way, to discriminate between signs of similar shape.

The maps of children in block 4 display increasingly sophisticated use of cartographic language. Most of the signs on these maps are abstract, bearing little visual resemblance to their referents. This increased distance between sign and referent is most prevalent in the maps of children in block 4. For example, the school is represented by a black dot, a tar or bitumen area by stippled shading and the school fence by a linear pattern. Children in block 4 have encoded more information on their maps because the symbols they use are smaller and indicate the general location of objects rather than the exact location of point referents. Therefore, trees are represented by small dots rather than large circular patterns.

The maps of children in block 4, like those of children in block 3, are relatively uncluttered because of the size of the cartographic signs used and the more careful selection of cartographic information. The labelling and verbalising of the earlier blocks is confined in block 4 to the identification of key school buildings and playing areas (see Figure 8).

The children in block 4 make greater use of the direction indicator, legend and colour in their maps. They draw the direction indicator as a north point or as a representation of the cardinal points. The legends for the maps are comprehensive and occupy considerable area on the map page. The increased use of colour in cartographic signs is pronounced. The colours are used in a conventional sense, e.g. green for natural vegetation and blue for water. They also discriminate between signs of similar shape, e.g. types of buildings.

The characteristics of the cartographic signs used by children in each of the four blocks of concrete map-reasoning are summarised in Table 6.

Table 6 indicates that there is a sequence in the children's use of cartographic signs across the four concrete map-reasoning levels. Children at the lower end of the sequence (block 1) use mostly cartographic signals, a large amount

Table 6: CHARACTERISTICS OF CARTOGRAPHIC SIGNS USED BY CHILDREN IN FOUR MAP-REASONING BLOCKS

VARIABLE	BLOCK 1	BLOCK 2	BLOCK 3	BLOCK 4
Signals	Common	Some	Nil	Nil
Mimetic Symbols	Some	Common	Some	Nil
Abstract Symbols	Nil	Nil	Some	Common
Verbalisation	Common	Common	Some	Some
Legend	Nil	Occasional	Common	Common
Direction Indicator	Nil	Occasional	Occasional	Common
Colour in Signs	Nil	Nil	Occasional	Common

Nil = no evidence
Some = evident characteristic
Occasional = infrequent characteristic
Common = widespread characteristic

of verbalisation, and no legend, direction indicator or colour. Children in block 2 use mostly mimetic symbols, a large amount of verbalisation, limited use of a legend and direction indicator, and no colour. The children in block 3 use a blend of mimetic and abstract symbols, some verbalisation, a legend, and occasional evidence of colour and a direction indicator. Finally, children in block 4 use abstract symbols, which are decoded in a legend. They use colour in a conventional sense and as a discriminator. Some verbalisation is evident in their labelling of buildings and playing fields. Direction indicators are used widely.

The above results concerning children's performance in cartographic language are consistent with Piagetian notions of development. They suggest that the developmental blocks across the concrete level of map-reasoning are sequential from block 1 through block 4.

CONCLUSIONS

This study revealed that for children at the concrete level of map-reasoning:

1. There was a definite development in their competence in cartographic language from the younger children (8+ years) through to the older children (14+ years). This development was more evident in their comprehension of cartographic signs than in their identification of such signs. This development was so for the comprehension of both qualitative and quantitative line, point and area signs, and for the standard elements. The children's identification of cartographic signs lacked substantial evidence of development except for the standard elements, quantitative line signs and qualitative area signs because competence was acquired at an earlier age by the children.
2. There was a definite development in their performance in cartographic language from the younger children (8+ years) through to the older children (14+ years). Unlike the children's development of competence in cartographic language, their performance in cartographic language revealed limited development at the upper end of the concrete map-reasoning level. This development was reflected in the use of cartographic signals and pictorial/mimetic symbols by children at the lower end of the concrete map-reasoning level and by the use of more arbitrary, abstract symbols at the upper end of the concrete map-reasoning level.

From the aspects of semantics, the results indicate that children at the concrete level of map-reasoning do not identify and comprehend all types of cartographic signs equally. There is a definite development in the children's ability to identify standard elements and to a lesser extent quantitative line signs and qualitative area signs. Also, there is little development in the children's ability to identify qualitative line signs and quantitative area signs. However, their ability to comprehend all forms of cartographic signs indicates a definite progression in development across the concrete map-reasoning level.

This concern for semantics in the development of cartographic language produced results which imply the importance of the distance between a cartographic sign and its referent. The children in the study found the cartographic signals on the coloured orthophotomap easier to understand than the abstract symbols on the coloured topographic map. As the children progressed across the concrete map-reasoning level, they became more able to understand the arbitrary, abstract symbols typified on a topographic map. A similar pattern was evident in the children's performance in cartographic language in their maps: the younger, more concrete-thinking children presented a mixture of cartographic signals, e.g. duplication of the rooflines of buildings, and pictorial symbols whilst the older, less-concrete oriented children presented a mixture of pictorial and abstract symbols.

This study has a number of implications for curriculum developers and classroom teachers. For curriculum developers, this study implies that children are developing competence and performance in cartographic language well into their adolescent years. Therefore, curriculum statements concerning mapping should include specific statements relating to the children's development in cartographic language. These statements should focus on the children's development of an understanding of cartographic language rather than assuming that its development is a natural process.

The conclusions of this study indicate that children at the concrete level of map-reasoning display a range of development in becoming competent in cartographic language. The children usually are more competent at identifying cartographic signs than comprehending them. These conclusions imply the need for cartographic learning experiences consonant with the children's level of competence in cartographic language. This implies the use of maps containing signs which do not display great amounts of distance between sign and referent. Maps of this type include orthophotomaps and those containing pictorial symbols. For the older, concrete-level thinkers, simple topographic maps can be used to build on the above samples. For the younger concrete-level thinkers, vertical aerial photographs could be used as an introduction to maps. If possible, the vertical aerial photographs should be coloured.

Age is not as significant in the children's performance in cartographic language. This implies that each child should be treated as an individual when drawing a map. The sophistication of the cartographic language each child uses on his map will vary according to his competence in the language. Therefore, classroom teachers should allow each child to use the cartographic language which suits his map-reasoning level and to develop gradually the signs so that the child uses increasing distance between sign and referent. These implications necessitate the teacher's becoming aware of the children's map-reasoning level, as well as their level of competence and performance in cartographic language. Finally, these conclusions imply the need to provide children with an atlas which is consonant with their level of competence in cartographic language.

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PROBLEMS IN THE IDENTIFICATION OF SOME TOPOGRAPHIC MAP SYMBOLS BY UNINITIATED CHILDREN - A PRELIMINARY INVESTIGATION FROM ZIMBABWE

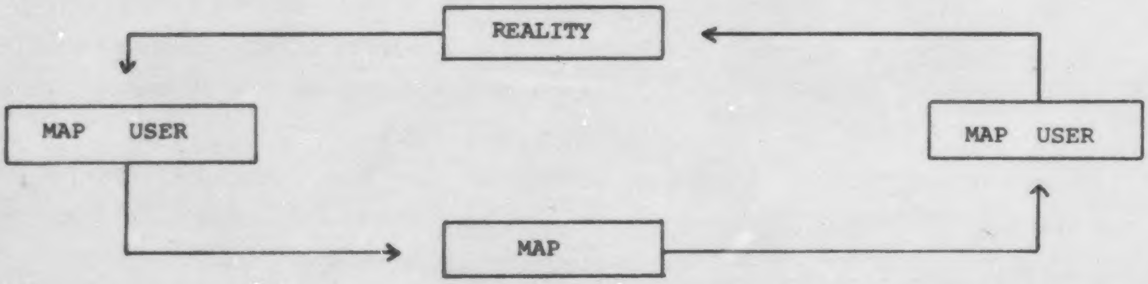
by LAURA S. DAVIES*

Abstract. *The most elementary step in the cartographic communication process is that of symbol identification which was defined in the study as simply the naming or labelling of the referent to sign or symbol. Symbol identification was investigated using a selection of 22 line, point and area symbols on local 1:50000 topographic maps. Primary school pupils from the Salisbury area of Zimbabwe, who were unitiated in the use of topographic maps were selected for the study. One school was chosen to represent each of the main cultural groups, i.e. African, Indian/Asian, European and a random sample of pupils was selected from each school.*

GENERAL INTRODUCTION

In the most general terms, the nature of the problem of this investigation concerns cartographic communication. In 1969 Kolacny first published in English the phrase "communication of cartographic information", defined by Wood (1972) as "cartographic communication, ... the process whereby information is selected, symbolised on a map and subsequently perceived, recognised and interpreted." Several authors have formulated varieties of a model to explain this process (Kolacny 1960, Wood 1972, Ratajski 1973, 1978, Robinson and Bartz 1975, Guelke 1976, Board 1977, 1978).

The model, at its most elementary level may be presented thus:



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It will be noted from the above model that "communication is complete only when the coded message has been deciphered and interpreted ..." (Wood 1972). Implications for geography teachers should focus on ENSURING that the map user or pupil has in fact perceived reality behind the map in the way that the map maker intended, instead of, as seems likely, ASSUMING that this has in fact taken place.

But whereas spoken and written language are universally accepted as a means of communication, maps are commonly regarded as the geographer's particular TOOL, seen essentially in terms of a set of skills rather than an "autonomous field of human communication with its own 'language' for the transmission of information". (Guelke, 1974). Thus Chorley and Haggett write in their book Frontiers of Geographical Teaching (p. 240) that "maps are often referred to as THE geographical tool", (also Satterley 1964, Wooldridge and East 1951). Chorley and Haggett are widely recognised as leading geographical educators, and their book is indeed justified by its contents.

It is this author's view that this restricted interpretation of the map as a mere tool rather than a communications system, tends to limit its use and its value in training basic skills; that teachers tend to pay lip service to the role of maps in geographical learning; and that the concept of graphic literacy is in itself not widely understood. (Balchin 1966, 1972, 1976).

The research reported here is part of an on-going investigation into difficulties experienced by secondary school pupils in Zimbabwe in using the 1:50000 topographical survey maps of this country. Because the nature of the difficulties of this problem are still unknown, a preliminary investigation is being carried out, designed to identify and classify the items of difficulty in the cartographic communication process of these maps, and to establish the age/grade range of the problems. Only the results of the preliminary baseline investigation are reported here. Before doing so however, it is convenient to consider why the topographic survey maps provide the focus for the investigation, and also to provide some background facts concerning secondary education in Zimbabwe today.

TOPOGRAPHIC SURVEY MAPS

The 1:50 000 maps have been selected to provide the focus for the investigation because they provide a convenient and clearly definable frame for the delimitation of the problems. Furthermore, topographic maps are specific and unique to a country and are published on a national basis wherever the means are available: they are the most commonly used national maps (754, 566 were issued from The Surveyor General's Department in 1979). They provide educators with scale advantages in that they permit the map reader to actually journey through real space while referring to the cartographically reduced space, and to match map symbols with their reality referants. They presently form the basis for a compulsory question in the British based 'O' and 'A' level public examinations in geography held in Zimbabwe, a country where secondary schools are heavily subjected to the controls of public examinations, whose certificates provide keys for most forms of subsequent advancement. This study has therefore potentially considerable practical significance. It is instructive in this context to note that in 1978 the AEB examiner's reports on map reading ability of the candidates of this country were rather scathing.

A NOTE ON EDUCATION IN ZIMBABWE

Zimbabwe has a population of some 7 250 000 (there has been no census since 1969), of whom less than 4% are White, plus a very small number of Asians and people of mixed race or Coloureds. The remainder are Blacks. With a population growth rate estimated officially at 3.5% per annum, half the population are under 16 years of age.

Prior to and during the government of the Rhodesian Front, independent schools outside of the Tribal Trust Lands were multiracial but in practice only small numbers of non-white pupils were enrolled. Mission schools located in the Tribal Trust Lands were and remain exclusively black. Government schools were segregated by race, and the Ministry of Education was divided into African and non-African divisions. The relevant legislation was repealed during the period of the Transitional Government from 1978, since when all educational establishments have been non-racial. Today, whereas schools which were formerly Black remain virtually exclusively so, formerly all-white schools, mainly urban, are admitting increasing numbers of Black pupils.

Standards of living vary greatly between the three ethnic groups, being generally much higher among Whites, lower among Coloureds and Asians, and lowest among Blacks, although there is an increasingly significant overlap of Blacks into higher levels. These living standards are closely, although not exclusively, related to educational and economic opportunities in respect of which the majority of Blacks remain gravely disadvantaged. Furthermore, far more than other groups, their educational opportunities in rural areas were gravely disrupted by the war, when over 1 600 schools were closed for varying periods of time. Not all these have as yet been fully re-established.

The three main groups, (Coloureds and Asians are combined for convenience, and attend the same schools), provide an opportunity to set the investigation into a cross cultural framework, and the three schools chosen for the initial testing are respectively exclusively Black, predominately Coloured and Asian, and predominately White. The sampling therefore effectively achieves a cross-cultural representation.

Clearly, through weight of numbers and a history of educational discrimination which it will be the policy of any majority government to change, the Blacks present the main focus for attention. Their problems of cartographic communication are twofold, although it is wrong to think of these as necessarily exclusive to them. Firstly it is widely accepted in educational circles that a cultural background of parental literacy, pencil and paper games and puzzles etc. provides a foundation training for children to think in and manipulate abstract ideas. Such cultural practices or the opportunities for them, have not been common among the mass of African families, who are still mainly rural. Furthermore in the pre-colonial period there was no indigenous language in a written form so that the indigenous population was entirely illiterate a century ago. The diffusion of literacy is still far from complete among Africans due to this late start, plus retarded economic development and the continuing remoteness of life from modern influences for many in tribal areas. It is therefore commonplace for school pupils, themselves now literate, to come from illiterate or near illiterate homes which do not therefore provide such a foundation training.

Secondly, English is the medium of instruction in all secondary schools. Therefore pupils not having English as a home language are likely to face the problem of working in a second language. In the case of Blacks entering formerly White schools, they do so in classes where the majority do not have this disadvantage. This applies to map study instruction as much as anything else. However, in this connection, it may be important that if African pupils are able to accept the principle of cartographic language as a non-verbal language that has to be learned 'de novo' by all, their particular problem of learning in a second language would be at least diminished in as far as Geography is concerned.

INTRODUCTION TO THE RESEARCH

PURPOSE OF THE INVESTIGATION AND THE SAMPLE

The most elementary step in the cartographic communication is that of symbol identification, defined in this context as simply the naming or labelling of the referant to the sign or symbol, which requires recognition of the symbol colour and shape, and a degree of understanding of the interplay of colour on point, line, and area shapes on classification categories. Symbol comprehension is not being tested at this stage.

In this country the 1:50000 topographic survey map is introduced only in the secondary school; in order therefore to ensure no previous class experience of this map, the population for this particular part of the research was limited to Salisbury urban primary schools. One school was selected to represent each of the main cultural groups, African, Indian/Asian and European. All these schools are co-educational.

It was decided to test a sample of only three classes, one from each school. This immediately raised a problem of the control of variables in that the numbers of pupils in the final grade of the three schools varied considerably, as did the practice of streaming on academic ability, (see Table 1). Furthermore since African pupils generally start their schooling later than the others, their mean age in their primary year is higher, which is why no correlations have been drawn between age and achievement in these tests. However for the purposes of this investigation it was considered more important to select pupils on the basis of school grade rather than age. The sample selected effectively achieves a cross-cultural representation and is a reasonable representation of present practice, except that in school Z scripts by the African pupils were withdrawn to facilitate comparison.

School X was a large primary school located near the city core, between an industrial area and a high density residential area for factory workers. Due to the influx of refugees this school was at that time running two sessions a day. School Y is an Asian/Coloured school in a middle income residential suburb serving a light industrial area. School Z is an independent school in a high income area whose pupils may be described as generally having been drawn from privileged homes.

TABLE 1

School	Dominant Race	No. pupils in Grade 7	No, pupils in Sample	Mean Age in Years	Age Range in Years	Academic Selection Procedure
X	African	320	46	13.7	15.3/ 12.7	non-streamed
Y	Asian/ Coloured	167	33	12.3	13.5/ 11.7	streamed - mid grade selection
Z	European	46	40	11.2	13.2/ 10.7	whole grade included

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DESIGN

A selection of 22 point, line and area symbols was chosen for testing, (see Table 2). Since random guessing was not considered desirable, these were presented in four deliberate groupings designed in themselves to form major identification clues, which if accepted and followed by the pupils, were assumed to have provided some evidence that the subjects had used reasoning during the identifying process. The grouping clues were bolstered by careful wording in the verbal instructions given by the test administrators. For these reasons a double marking system was applied to the answers:

a) a CONVENTIONAL score, evaluated against the conventional meaning stated in the key;

b) A THEME score according to whether the suggested theme in the grouping was followed.

In order to eliminate some variables that might have arisen at this age from misreading written instructions of a type which they were not familiar, all questions and instructions were given verbally, the use of grid-coordinates to indicate location was specifically excluded, and examples of the relevant symbols on the map were pointed out on a demonstration map mounted in front of the class. Supervisors were asked to ensure that each pupil had found an example on their copy of the map. Answers were written on a single sheet of paper, which emphasised the grouping, and which also had a coloured representation of each of the required symbols except the last four.

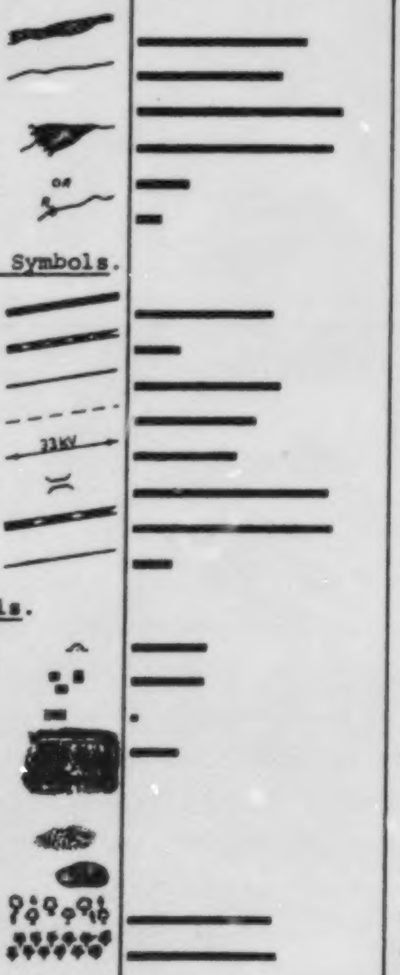
ADMINISTRATION

A major problem in controlling variables arose in respect of the administration of the test. It was felt that the "strangeness" impact of an unknown white woman administering the test to African pupils who were used to a male African teacher who could speak their own language would be greater than the same person administering to the European children who were used to that type of teacher. It was therefore decided to use the alternative method of using the normal class teachers to administer the test, trusting that the written instructions were sufficiently detailed and well understood to ensure comparability. For this reason the relevant class teachers were given very detailed instructions, which were also discussed and explained verbally to them. These instructions, which were identical for all teachers, consisted of information on the purpose of the test for the teacher's benefit; information on the purpose of the test for the teachers to convey to the pupils; and detailed wording for each question. However, due to wide cultural differences among the children tested teachers were invited to make the introduction and to administer the test in the language in which the schooling is normally conducted, so that language barriers would not form a variable, (although in the event all the instruction was given in English).

Teachers were also permitted to use their own discretion as to precisely how the introduction to the pupils was worded, but were asked to ensure that they conveyed to their pupils that: this was a research exericse which would benefit both older pupils and the cartographers of this country; that there were no right or wrong answers as it was required to find out what the pupils themselves thought the map symbols meant; that maps are a form of language in which the information is given in code which cannot be deciphered without a cipher kay.

SECTION A. THE BLUE WATER SYMBOLS

The five symbols tested, (see Table 2) - a river, tributary, dam, resevoir and rapid were reproduced on the answer sheet in blue. Clues as verbal instructions pointed out that various symbols were printed in different colours,



No.	SECTION A. Water Symbols		Scores as mean % X %	Y %	Z %	C %
3.	river	blue	67	36	77	62
4.	stream		56	15	82	54
5.	difference		87	33	95	75
6.	dam		67	45	90	69
7.	reservoir		0	2	49	18
8.	rapid		0	1	22	8
	SECTION B. Communications Symbols.					
1.	wide tar road	red	56	76	75	68
2.	narrow tar road		9	3	7	16
3.	dirt road		41	67	55	53
4.	tract or path		22	57	62	45
5.	powerline		2	3	54	17
6.	bridge	black	61	67	85	70
7.	railway		43	89	87	70
8.	boundary		4	33	7	13
	SECTION C. Building Symbols.					
1.	hut	black	2	81	7	26
2.	buildings		19	21	35	25
3.	compound		0	3	0	.8
4.	built up area	grey	12	5	4	17
	SECTION D. Surfaces.					
1.	cultivated land	brown	2	0	2.5	.8
2.	smooth rock	grey	0	0	0	0
3.	bush	green	48	69	52	50
4.	orchard, plantation.		47	45	62	52
	SECTION A Convention score		46	23	69	48
	" Theme score		67	76	80	74
	SECTION B Convention score		23	42	52	38
	" Theme score		65	82	82	76
	SECTION C Convention score		6	45	13	19
	" Theme score		65	78	41	61
	SECTION D Convention score		27	30	32	30
	" Theme score		41	32	53	43
	Mean Convention score		25	37	45	36
	Standard Deviation Convention score		1.82	1.67	2.1	.87
	Mean Theme score		61	71	70	67

144

*symbols used colour

TABLE 2.

and pupils were asked to find as many examples as they could of the blue symbols on their maps. On these maps all water symbols are blue, and these are the only blue symbols. Although water is not in fact blue, it was decided to test those pupils on the popular convention that water is represented by blue. In order therefore to invoke a declaration of association between blue and water, two deliberately leading questions were asked, whether the pupils thought these signs had been coloured blue on purpose, and if so why.

In the following tables, scores each for schools X.Y.Z. are given as mean % and 'C' represents the combined mean % between pupils (not between schools).

Table 3.	Schools	X	Y	Z	C
	scores as mean %	%	%	%	%
	acceptance of blue used for water purpose	89	97	100	86
	acceptance of blue/water as convention	66	97	98	82

One may now make an assumption that those pupils who have accepted the blue/water convention will seek to identify the blue symbols with water features. For reasons which will be suggested later, the results were only partly positive.

Table 4.	Schools	X	Y	Z	C
a.	scores as mean %	%	%	%	%
	Convention score, questions 3,4,5,6,7,8.	46	23	69	48
	Theme score questions 3,4,5,6,7,8.	67	76	80	74
	Wild answers not related to water	33	24	20	26
b.	Schools	X	Y	Z	C
	scores as mean %	%	%	%	%
	Convention score, questions 3,4,5,6 ONLY	69	32	86	65
	Theme score, questions 3,4,5,6 ONLY	90	97	99	95
	Wild answers not related to water	10	3	.6	4.5

THE SCORING

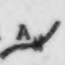
A response was scored as correct on the Convention Score if it bore a reasonable similarity to the interpretation in the key. From the Table 4,a. the following points may be noted. The Convention score, questions 3 - 8, rated a mean % of responses of 48%. The method of Theme scoring allocated a point for every response that related to water, regardless of whether it was conventionally correct. According to the assumption stated above, since 80% of the pupils stated an acceptance of blue/water convention, this theme score should have been at least as high. But the combined mean theme score was 74%. Furthermore for the assumption to have been wholly maintained there should have been few 'wild' answers, or responses totally unrelated to water, but Table 4.a. shows that an unaccpetable 26% falls into this category. If, however, questions 3 - 6 ONLY are scored in the same way, a very different picture emerges, as shown in Table 4.b. Now the mean Convention score rises from 48% to 65%, while the Theme score rises from 74% to 95%. But the most significant difference is the drastic reduction of wild answers from 26% to 4.5%. Clearly identification of the symbols in question 7,8, consitutes a problem. Scores for these two questions are as follows.

Table 5.

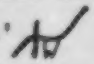
	Convention score				Theme score				Wild responses unrelated to water			
Schools	X	Y	Z	C	X	Y	Z	C	X	Y	Z	C
scores %	%	%	%	%	%	%	%	%	%	%	%	%
questions 7,8.	0	5	35	13	22	32	42	32	78	68	58	68

Now a reverse trend is shown with extremely low Convention scores and exceptionally low Theme scores (cf. Table 2). The wild responses are now high for all schools. Investigation suggests that this is due to "reader noise", defined by Gerber (1978, p. 14) as "that generated by the map user who sees aspects of the map in a manner different from that intended by the map author".

The symbols in these two questions have three components, colour and shape as had those of the other questions, but they have in addition a letter from the alphabet, in both cases a blue 'R'. 19 pupils in school Z gained a correct Conventional answer for question 7 of 'Reservoir" or an equivalent like 'a round place where water is kept'. But 'reservoir' is not a very common word in ordinary everyday English and it is only in school Z that one may assume that the majority of pupils speak English at home.

Faced with the puzzle of this unknown symbol ('Ro'), some pupils gave answers such as 'a river with a stop in it'. Others apparently accepting the ring symbol as a letter, like the letter R, answered 'River Orange', 'River Odzi', or 'no river'. Similarly for the rapid symbol  answers included 'river blocked', and 'river closed', while 21% of school X answered 'little bridge'. These answers suggest that the pupils were not blindly guessing, but trying to reason from clues on the map and from previous experience to obtain acceptable answers. It also seems fairly clear that the process of reasoning was limited to the 'one step reasoning', which if it provided any answer at all, was accepted. The 'little bridge' responses were a good example of this, for a line at right angles across the river might well have represented a symbol for a bridge. But if they had checked their 'guess' in the context of the map, or had shown any real comprehension of a bridge across a river, they would, for instance have noticed that no paths lead to these rapids. This one-stop reasoning process shows itself repeatedly in their responses.

The limited reasoning process is even more in evidence when one investigates the reasons for the very high proportion of wild answers. It would seem that when faced with alternative clues, such as the inclusion here of a letter, many pupils chose the letter as the main clue guide rather than the colour blue, perhaps because letters of the alphabet are more familiar than abstract symbols. 44% of the pupils gave answers for both these questions which began with the letter 'R', of which only 6%, all from school Z, had both answers correct. Many answers like 'road','railway', 'ranch', 'rock', 'robot', were not connected with water and were therefore illogical in the map context.

To further test the pupils' selection of a letter, rather than colour and shape as a primary clue, the symbols for 'Well' Wo, and 'Waterfall'  were introduced in the tests for schools Y and Z only, although there were no specific examples of these on the map section used. These symbols precisely resemble the others except that the letter is different, and 'W' is more suggestive of water as 'R' is suggested of river. The pupils of school Y showed themselves to be most influenced by the letter clue, 51% have answers for questions 9,10 which both began with the letter 'W', of which 45% were water based, although many like 'wave' 'whirlpool', 'dangerous water', and 'water channel' were incorrect. 21% of this group gave answers to questions 7,8 beginning with 'R' as well as 9,10 beginning with 'W'. In other words this small group consistently followed the letter lead through four questions regardless of context clues on the map. As a further indication of the extent to which the blue water clue was discarded in favour of the letter clue, the mean % responses for questions 7,8 (calculated together) not connected with water were X 50%, Y 46%, Z 40%.

SECTION B. COMMUNICATIONS SYMBOLS

	X	Y	Z	Combined
Scores expressed as mean %	%	%	%	%
Convention score	23	42	52	38
Theme score	65	82	82	76

Table 6.	X	Y	Z	Combined
Secondary road identified as railway	24	33	45	36
Secondary road and railway both as railway	9	27	39	22
Secondary road and railway reversed	11	0	3	5
Decrease in road size	46	94	97	76
Powerline as distance measure	24	54	20	31
Nil response	1	2	8	4

This section used 8 different kinds of line symbols in two colours - black and red, representing four grades of road, a power line, a road crossing a bridge, a railway, and a fine black line to show farm boundaries (see Table 2).

The mean Conventional score was 38%. Some of the persistent errors were as follows:

1. On these maps both the secondary road and the railway are shown by a broken coloured and white line, similar except for the colour - red for the road and black for the railway; 36% total responses identified this road as a railway, and 22% listed both symbols as a railway (presumably they thought there might be more than one grade of railway as there are of roads) see Table 6. above. Only 5% reversed the road and railway, noticeably more in school X. That this has already been recognised as a potential source of confusion by our Cartographic Department is shown by the fact that in the new edition (post 1975 edit. 3) this source of confusion is eliminated and road grades are now indicated by simple decrease in width. However Editions 1 and 2 are still widely in use.
2. The powerline responses formed another source of confusion. This symbol is represented by a fine red line marked with equidistant red discs and the 33 kV symbol; 31% of the pupils read these as some type of distance measure which is perhaps not surprising since all the other red lines on the map are roads. That at lease some pupils read the 33kV as kilometre measures is clear from answers (school X) "the road in kms," and school Y'33kms to go." School Z had evidently done some studies on power, because they correctly identified the 33kV as a power symbol.
3. A further problem arose in that some pupils, especially those in school X evidently did not conceive of the possibility of four different grades of road. Presumably their previous cartographic experience with atlases and home area mapping precluded this. Nevertheless 65% of the pupils in School X listed more than two grades of road, and 76% of all the responses indicated that the different types of red line represented different grades of road.

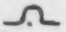
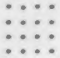
In the scoring it was necessary to use a degree of value judgement, and therefore responses like a 'path road' and a 'people road' were scored as equivalent to track, and a 'traffic road' and a 'road for cars' were scored as equivalent to a tarred road. Another response 'long ago ways' for the broken line of the track indicated use of previous atlas experience in that historic routes are often marked in this way.

Evidence that the majority of pupils accepted these line symbols as primarily connected with communications is shown by the combined Theme score of 76%. While, as indicated above, some pupils had difficulty in conceiving four types of road, a great many included communications links such as telephone lines and flight path ('the way of aeroplanes') which are not shown on these maps, as well as power lines. Thus some pupils identified among these line symbols two types of road, two types of railway, a track, powerline, telephone line and air flight path.

Nil responses must also be considered as an answer. It should be noted that the instructions to the pupils by the class supervisor specifically encouraged the pupils to guess. School Z registered only 1% nil responses which showed a readiness to venture and risk an answer even when they were not sure they were right. However school Z which gained the highest % correct answers on the Convention score, registered a very high 8% nil response which suggests that the group which were most sure of themselves were least willing to hazard a guess when faced with the unknown. This general pattern pertained to all four sections.

SECTION C. BUILDING SYMBOLS

	X	Y	Z	C
	%	%	%	%
Convention score	6	45	13	19
Theme score	65	78	41	61
Huts observed as hills	46	.7	57	38
Huts correctly identified	2	81	7	27
Nil response	0	6	15	27
Buildings specified	34	28	11	24

The mean Convention score for the four symbols related to buildings was the lowest for any section, and while schools X and Z both scored their lowest in this section, school Y scored its highest. This suggests for schools X and Z a potential noise factor or source of confusion in the symbol identification. It seems very possible that this may have been caused to the iniated by the problems of cartographic generalisation at this scale. For instance fairly built up areas are depicted by grey surface shading separated by thick red main roads, but brick buildings clearly separated by open land are shown in plan from a vertical perspective, apparently scaled. One result of this is that a small country shack has clear visual impact on the map, while dominant urban buildings are not shown. In complete contrast to the scaled plan view brick building is the hut symbol  an apparent iconic representation in horizontal perspective. The hut, the common dwelling of the rural African, has walls of clay plastered poles and a conical thatched roof, and is built entirely of natural materials of the tree savanna. However the hut symbol on the map in no way resembles the Zimbabwean hut which is shaped though they do resemble the South African Zulu beehive hut, made mainly of grass where wood was short on the Natal grasslands. Therefore this symbol has no visual connection with its local reality, and since it is not depicted as an abstraction it produces an incorrect signal. The score for the African school was amongst their lowest, and although these children are now urban dwellers, many may have stayed in a rural hut and all must have seen one. School Y however, must have used this symbol as it stands and therefore known its conventional meaning, because their score of 81% was their second highest and constasts sharply with the combined average of the other two schools of 4.8% correct. When searching through the answers for a clue as to why so many children misinterpreted this answer, it was found that 45% school X and 57% school Z identified this as a type of raised relief feature such as a hill (although this varied from anthill mounds to mountains) suggesting that children at this age have little conception of cartographic scale. Two pupils labelled these as graves, and two as little bridges. It has already been stated that brick buildings are apparently drawn to scale. It should now be noted that round huts (rondevals) in an urban compound are shown  also suggesting scale, and that although these huts are approximately the same size on the ground as the rural huts, on the map this urban hut is drawn the same size and shape as the rural hut's apparent doorway. Only one child correctly identified it. However it is interesting to note that many responses showed an effort to identify this symbol with features of their own locality (which differed from school to school) such as 'playground', 'poles', 'parking area' and 'factory chimneys'. The brick building symbol on these maps is specifically a generalisation of a building, but perhaps because they stand out so sharply, many pupils sought to identify this symbol as a specific building, and although many answers were sensible like 'shops', 'store', 'clinic', 'school' they were scored as incorrect on the Convention score. For instance school X scored only 19% on the Convention score, but 34% of their answers specified a particular building. In the question on the built up area, school X scored the highest % correct answers. Responses which clearly indicated a built up urban area like 'town', 'township' and 'city' were marked correct, but this item was difficult to score as many pupils gave answers like 'where many people live', 'crowded place', 'overpopulated area', which although they suggest urban areas, emphasises people and not buildings, and were therefore scored as incorrect.

The increase of 42% (the highest for any section) from a mean Convention score of 19% to a mean Theme score of 61% suggests a general acceptance by the pupils of the grouping clue as a 'building' guide. Furthermore completely wild answers averaged only 12%.

SECTION D. SURFACES. QUESTIONS 1 - 2 ONLY

	X	Y	Z	C
	%	%	%	%
Questions 1,2, Convention mean	2	0	2.5	.8
Questions 1,2, Theme mean	17	0	18	13
Hill top recognition, question 2.	0	30	60	

The convention responses to questions 1,2, were the lowest for any question, and school Y scored 0% on both the Convention and Theme scores, while the Theme scores for schools X and Z showed a reasonably correct appreciation of the nature of the symbols.

The cultivated land in question 1 is shown by brown shading, and many pupils gave quite sensible answers, although conventionally incorrect, like 'farm', 'sandy soil', and 'brown soil'. One pupil, (school X), perceived the symbols for 1 and 2 as a pair, labelling them 'brown soil' and 'black soil'. The symbol for 2 is defined in the legend as "smooth rock", but in the field it is always a dwala or granite whale back, which provides a clue to the initiated that the area is on granite formation, in this country often associated with goldbelts.

It is important to note that despite the low Convention response, 30% school Y and 60% school Z, associated this feature with hills and mountains, and of course dwalas are exposed only on hill tops. No questions were set on contours, nor did this question draw attention to them as they are not one of the most abstract symbols on the map. Most of the answers were short, but responses like 'high hills and peaks', and 'the highest peaks at the top of the contours' suggest that these children had correctly visualised the hill shape from the contour pattern, although unable to think of reasons why some hill tops should be shaded grey and others not.

QUESTIONS 3 - 4 ONLY

	X	Y	Z	C
	%	%	%	%
Questions 3,4, Convention mean	41	36	45	51
Questions 3,4, Theme mean	65	65	86	72
3,4, correctly differentiated pair	22	39	42	34
3,4, as a pair both concerning vegetation	54	57	80	64
3,4, both identified as non vegetation features	9	18	2	5

The mean Convention score of 51% is the highest for any group, which is not surprising as these two symbols most clearly resemble their referant, (Table 2) and furthermore are not misleading like the hut symbol. But while the majority responded to both symbols with vegetation features - (72%), a very much smaller proportion of 34% correctly differentiated between the two symbols to show that the first represented natural bush, and the second trees planted by man. Perhaps there is a potential noise factor in that the symbols representing natural bush might be rather too regularly spaced, in contrast to the planted trees which are supposed to give a measured visual impact on the map. It is interesting to note that 32% of the pupils of school Z specified pine trees for No. 4., in contrast to 30% school X who specified gum trees, in each case the dominant tree of that schools environment.

CONCLUSIONS

1. Since the overall mean Convention scores per item, from children of widely different backgrounds, uninitiated in these maps, shows that 11 of the 22 symbols were correctly identified by more than 45% of the children, it may be suggested that these children are capable of identifying symbols of this degree of abstraction from a multi-purpose map. Full comprehension in the deepest and widest sense of the meaning of these symbols in their cartographic context is essential if true cartographic communication is to take place. It is the author's contention that such comprehension grows with familiarity. If this is so then the more use pupils make of these maps the more likely they are to gain such comprehension. Therefore an early start can only be an advantage.
2. Teachers can learn as much about childrens problems with maps from the wrong answers as they can with the right answers.
3. Only maps at this scale permit reality reference, i.e., of identification of features on the map AND in the field. This is not possible with the small scale atlas maps so frequently used in the classroom. Fieldwork

with maps should generate a conception of the reality behind symbols, an essential factor in cartographic communication, and seemingly so often lacking in our pupils, who, since they are often taught this work as paper and pencil exercises, not unnaturally conceive of it in this way. However when cartographic vision has been acquired, there can surely be no quicker way of learning geographical details of areas in one's own country to which visits are not possible, than by the study of these maps. The many efforts of these children to transfer their knowledge of features in their local environment to the map interpretation, shows their willingness to accept this. This should be nurtured.

4. A notable feature of these responses was the willingness of the pupils to use the grouping patterns as identification aids, and their efforts to REASON through to a correct answer. Although some evidence of this was provided by the theme scores, it was nothing compared to the sparkling vividness with which the message came through when reading the responses. The combined Theme score of 67% shows a 31% improvement on the combined Convention score of 36%. Furthermore all three schools scored over 60% on the mean Theme score, and considering the very considerable variations between schools on individual items there is remarkably little difference between their final Theme scores.
5. A Pearson Product Moment Correlation Coefficient on the top ten results from each school between Theme and Convention scores was .95, showing an extremely high correlation, and therefore that the successful Convention scorers accepted the Theme clue leads. However the same correlation among the lowest 10 results in each school showed a correlation of .82, which while considerably lower, shows that they also accepted clue leads. This strongly suggests that they would respond positively to guided learning of symbol identification.
6. A calculation of the % of Theme over Convention increases, reinforces the suggestion that these pupils would respond to the right guidance. While there were noticeable differences between schools in the various questions, differences between them on the combined Convention score are not so great, and the Theme averages snow even less difference.
7. If the majority these cartographically uninitiated pupils could score so highly on so many items, one must suspect the existence of an unacceptably high noise level in those symbols in which most scored low, e.g. the 'Rapid', 'reservoir' symbols, the powerline, hut, compound and dwala symbols. If this is so, cartographers may need to give more careful consideration to their form. Later parts of this project will investigate the degree to which these same sources of confusion pertain further up the school.

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THE MAP REASONING DEVELOPMENT OF EIGHT, TEN AND TWELVE YEAR OLD PUPILS AS REVEALED IN FREE RECALL SKETCH MAPS

by PETER WILSON*

Abstract. *Piaget and Inhelder (1956) asserted that one of the best ways of determining a child's level of development in spatial reasoning was to have a child draw-a-map. One hundred and ninety-six eight, ten and twelve year old pupils were asked to draw a free recall sketch map of two common, familiar, meso sized areas. The pupils' abilities to draw the maps were related to ten independent variables. The study concluded that a free recall sketch map was a suitable device to aid identification and prediction of the level of map reasoning development of pupils in the primary school.*

INTRODUCTION

The purpose of this study is to investigate the map reasoning development of eight, ten and twelve year old pupils as revealed in free recall sketch maps. The study also investigates how the map user factors of non-verbal I.Q., verbal I.Q., general ability, reading age, Iowa Test of Basic Map Skills,

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Feldman's Map Test Reasoning Level, Feldman's Map Test Score, socio-economic status, sex and age (within year levels) affect the ability to draw a free recall sketch map. The study is aimed at three broad interest groups — classroom teachers, curriculum developers and researchers — particularly those within the areas of geography and social studies. More specifically, the objectives of the study are:

1. to describe, analyze and display the free recall sketch maps of the pupils within each year;
2. to determine whether non-verbal I.Q., verbal I.Q., general ability and reading age affect the ability to draw a free recall sketch map;
3. to determine whether the Iowa Test of Basic Map Skills and Feldman's Map Test affect the ability to draw a free recall sketch map;
4. to determine whether socio-economic status, sex and age (within year levels) affect the ability to draw a free recall sketch map;
5. to determine whether there is a hierarchy of difficulty for the four elements of a map (i.e. arrangement, proportion, perspective, abstraction) when a pupil draws a free recall sketch map;
6. to determine whether the separation between the map drawer and the area to be mapped, i.e. distancing affects the ability to draw a free recall sketch map; and
7. to determine whether a free recall sketch map identifies the level of map reasoning development of pupils in years three, five and seven.

BACKGROUND TO THE PROBLEM

Piaget and Inhelder (1956: 419-446) concluded their studies of children's concepts of space with two tests. The results of these tests are outlined in their book - *A Child's Conception of Space.* The first test involved placing a doll on a model landscape, using the model's natural reference system of paths and streams. Two identical models were used, one of which was rotated 180 degrees. The researcher placed a doll on one model and the child had to place another doll in the same position onto the model that had rotated 180 degrees. At a later stage a screen was placed between the two model landscapes, so that the child could not see them both at once, and the exercises were repeated. This procedure is designed to test a child's co-ordination of perspective and is often called the "doll and three mountains" test.

The second test consisted of the child reproducing a copy of a model village which was on display in front of him or her. This construction used real model features. The child then drew the model village from a certain point of view, either a forty-five degree view or a ninety degree view, on a piece of paper at a reduced scale. The abilities involved in the latter part of this second test (i.e. drawing a model village from a ninety degree view) appear to have remained unresearched for the past thirty years, despite the importance that Piaget and Inhelder placed on the findings. Only Feldman (1969, 1970, 1971) and Snyder, Feldmen and La Rossa (1976) appear to have used the findings. This test forms the basis of this study.

Piaget and Inhelder saw this culminating exercise as a more complex, general problem but felt they could find no better way to examine a child's spatial reasoning development than to have the child create a "topographical schema" (i.e. draw-a-map). They saw this diagrammatic layout (i.e. map) providing a summary of all their investigations into a child's concept of space. The draw-a-map technique helped to identify the point at which a distinction can be made between topological, pre-logical and logical relations.

The location of objects in these abstract designs (maps), drawn by children is, for them, an expression of the child's spatial development and when the drawn map closely relates to the model, this "correct" form illustrates the culmination of the long process of spatial development of the child. The drawn map expresses the early, elementary sensori-motor and perceptual activity, its evolution into symbolic images and then via concrete operation to abstract or hypothetico-deductive operations.

Piaget and Inhelder (1956: 426) state that

> *In practice, the construction of a diagram or plan entails: (1) The selection of a particular point of view, together with certain pictorial conventions intended to express it ..... Thus from the very outset, all topographical representation involves projective features. (2) A system of co-ordinates — whose function should be self evident — along with the implied concepts of straight lines, parallels and angles. (3) Reduction to a specific scale, which entails*

> *the concepts of similarity and proportion. Hence the construction of a diagrammatic layout* [map] *incorporates in a single entity all the concepts examined ..... and at the same time shows how they are related one to another.*

The principal method employed by Piaget and Inhelder consisted of placing a number of model objects on the floor or table (e.g. church, houses, trees, etc.) and asking the child to draw them on a sheet of paper as seen directly from above; that is a "bird's-eye-view".

Unfortunately, Piaget and Inhelder use a literary style for all of this chapter, especially the explanation of the spatial reasoning stages that a child may go through. Therefore, the interpretation of a child's map is quite difficult. For instance:

> *BAG (5;4) ..... draws a grass border all round the paper, three trees in a vertical line, a lake with a stream on the right and a square field on the left. But he leaves large empty spaces between these items and does not reproduce the road which runs diagonally across the model, so that his drawing can hardly be described as a layout* [map] *in depth.*
> (Piaget, 1956: 433)

Only one example of a drawn map is reproduced in this chapter, that of Kra (six years one month), despite the graphic nature of the results of the tests. Kra's map is shown in Figure 1.

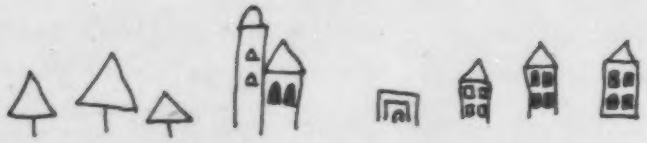

Figure 1: KRA'S DRAWING SHOWING AN EXAMPLE OF A LAYOUT BY SIMPLE ALIGNMENT.
(Piaget and Inhelder, 1956: 434)

Feldman (1971) has extrapolated a six category rating scale from the literary presentation of Piaget and Inhelders' (1956) stages of spatial reasoning in diagrammatic layout construction. The implications of Feldman's six stage map drawing categories served as the initial background for this study. A revised and more comprehensive form of the table was developed by Snyder, Feldman and La Rossa (1975). This revised table is possibly the first attempt to quantitatively score maps of a model village drawn by children. The testing, interpretation and implications of this table serve as the main background to this study. The table is presented in Table 1. However, this study is not centred on drawing a map of a model village, but is centred on drawing a free recall sketch map of a certain area.

Interest in the field of free recall sketch maps or cognitive ("mental") maps has increased in various disciplines in recent years. Most of the works are centred on macro sized areas such as a city, a local area, a neighbourhood or a route, such as from home to school. Some authors, such as Appleyard (1970), Catling (1978), Claparède (1903, 1924, 1943), Dart and Lal Pradham (1967), Ladd (1970), Pocock (1977), Shemyakin (1962), Spicer (1976) and Storm (1966) have categorized the free recall sketch maps on the basis of certain characteristics inherent within the maps. This has led to a range of subjective categories. No author has used a quantitative technique to score maps and hence bring some objectivity to the categories. This study uses a quantitative technique, based on the table of Snyder, Feldman and La Rossa (1975) to score free recall sketch maps of a meso sized area drawn by pupils in years three, five and seven.

The basis of this study is a compromise between the draw-a-map technique of a micro sized area, such as a model village; and the draw a free recall sktech map technique of a macro sized area, such as a city. This study, therefore, centres on children drawing free recall sketch maps of a similar. common, meso sized area. Two areas are used — the school ground and the local road intersection opposite the schoolground. The other problem in this study is to determine which factors may affect the ability to draw a free recall sketch map.

To date, no author has investigated which factors may affect the ability to draw a free recall sketch map. Numerous authors, such as Askov and Kamm (1974), Bartz (1970), Blaut, McLeary and Blaut (1970), Carswell (1970), Cobb (1973), Downs and Stea (1973), Drumheller (1968), Fischer (1968), Harvey (1973), Meyer (1973), Rhys (1972b), Robinson and Petchenik (1976), Rushdooney (1968, 1971), Savage and Bacon (1969), Storm (1966) and Towler (1968, 1970, 1971) have expressed concern over the lack of research and conflicting results in relation to children's mapping abilities. The limited research has also

Table 1: LEVELS OF SPATIAL REASONING DEVELOPMENT AS REVEALED IN MAP DRAWING (after Piaget and Inhelder, 1956: 429-446)

Level 1:	No spatial correspondence except for a few elementary proximities (about 4 years) Characterized by child's inability to distinguish between spatial proximity and logical resemblance or between spatial separation and logical difference. Yields objects on map which do not appear on model and objects on model which are not represented on map. Arrangement appears virtually arbitrary.
Level 2:	Partial coordination (about 4-7 years) Characterized by recognizable but inconsistent logical and numerical correspondence. Spatial correspondence often confounded with logical resemblance or limited to small groups of proximal objects and isolated left-right relations without an overall spatial plan. Representation limited to one dimension (i.e. uses frontal view) with detail and proportion essentially unrelated to model.
Level 3:	Midway between partial and beginning of general coordination (about 7-8 years) Characterized by inconsistent coordination, i.e. reasonable logical and numerical correspondence but with a mixture of perspective (e.g. frontal, 45°, 90°) and viewpoints, in poor but recognizable proportion to model. Larger groups of objects now linked together to produce primitive overall representations of model, ofter with "photograph-like" detail.
Level 4:	Beginning of general projective and Euclidean coordination (about 8-10 years) Characterized by items in good logical and numerical correspondence and arranged according to a crude two-way system of reference (i.e. width and depth) with a consistent 45° or 90° perspective. A legitimate two-dimensional representation of the model often with some evidence of abstraction, but with as yet inaccurate scaling — relative sizes of objects often proportional, but distances (especially heights in the 45° perspective) remain distorted.
Level 5:	Mastery of distances and proportions (about 10-12 years) Characterized by complete coordination of logical and numerical with spatial correspondences. Although not formally scaled with metrics and fractional reduction, an adequate diagrammatic representation of the model. A consistent 90° perspective with clear evidence of abstraction and symbolization.
Level 6:	The abstract plan with metric coordinates (about 12-15 years) Characterized by complete coordination, totally accurate scaling, a consistent 90° perspective, and use of abstract symbolization.

(Snyder, Feldman and La Rossa, 1975: 4)

Table 2: SPATIAL CONCEPTS AND FEATURE CLUSTERS USED IN SCORING MAPS

SPATIAL CONCEPTS (adapted from Piaget and Inhelder, 1956)

I. ARRANGEMENT — emphasizes topological concepts in lower levels and Euclidean concepts, i.e. systems of coordinates, in advanced levels.

II. PROPORTION — emphasizes Euclidean concepts, i.e. similarity

III. PERSPECTIVE — emphasizes projective concepts

IV. ABSTRACTION/SYMBOLIZATION — emphasizes pictorial conventions

FEATURE CLUSTERS

A. Buildings — easily identifiable logical class; regularly shaped; obvious third dimension, but relatively easy to represent.

B. Hill, bridge, island, other elevated land — among major features of model; relatively large, irregularly shaped; three dimensional; more difficult to represent.

C. Lake, river, roads, driveways, parking lots — major flat surfaces of model; easily represented.

D. Trees, fence, motor vehicles, flagpole, bushes — relatively small, more "incidental" features of model; obvious third dimension; relatively difficult to represent.

E. All-inclusive score — the map as a whole.

(Snyder, Feldman and La Rossa, 1975: 7)

been carried out over a wide range of areas relating to mapping abilities. However, this research has identified certain factors which may affect children's abilities to draw a free recall sketch map.

For example, Cole (1975), Gerber (1977a, 1977b), Russell (1975), Satterly (1964), Sorohan (1962), Towler (1971), Towler and Nelson (1968) and Zimmer (1967) found that age significantly affects certain areas of mapping skills. On the other hand, Bartz (1970a), Fischer (1968), Ladd (1970) and Murdock (1972) found that age had no significant affect on certain areas of mapping skills. Also, closely related to age, Bartz (1970b), Cole (1975), Feldman (1969, 1970, 1971), Miller (1974), Russell (1975) and Towler and Nelson (1968) found that the pupil's grade (year or year level) significantly affects certain areas of mapping skills. But Ladd (1970) found this not to be the case. These studies have involved tests of pupils across age or year levels. No author has investigated the effect of age within a grade (year) level.

Carswell (1968, 1970), Cole (1975), Feldman (1969, 1970, 1971), Murdock (1972), Satterly (1964), Towler (1970, 1971) and Towler and Nelson (1968) found that I.Q. (usually mental age) significantly affects certain areas of mapping skills. But Weinswig (1962) found this not to be the case.

On the question of male versus female; Cole (1975), Frye (1973), Gerber (1977a, 1977b), Lewis (1963), Russell (1975), Towler (1970), Towler and Nelson (1968) and Weinswig (1962) all agree that sex does not significantly affect mapping skills. Also, Towler (1970) and Towler and Nelson (1968) found that this is also true for socio-economic status.

Carswell (1968, 1970) and Fischer (1968) found that verbal I.Q. significantly affects certain areas of mapping skills; while Fischer (1968) and Kilman (1969) found that this was also true for reading age. Only Carswell (1970) has investigated non-verbal I.Q. and spatial ability (though numerous authors have recommended their investigation) and found that both significantly affect certain areas of mapping skills.

The Iowa Test of Basic Map Skills has been used by several authors to group pupils' test results for statistical analysis and several authors have recommended that this test should be investigated in relation to certain areas of mapping skills.

Feldman (1969, 1970, 1971) found that the two scores (Reasoning Level and Map Score) on his map test (Feldman's Map Test) were significantly related to pupils' ability to draw a free recall sketch map.

The factors for this study are based on the previous research. The map user factors chosen for this study are — non-verbal I.Q., verbal I.Q., general ability, reading age, Iowa Test of Basic Map Skills, Feldman's Map Test, socio-economic status, sex and age (within year level).

DESIGN OF THE STUDY

The study was carried out at Kelvin Grove Primary School, Brisbane, Queensland, Australia. The study was an exploratory investigation into the map reasoning development of pupils as revealed in free recall sketch maps. Hence, only one school was used for the study. The population for the study consisted of 196 pupils in years three (mean age eight years four months), five (mean age ten years five months) and seven (mean age twelve years six months). Each of the pupils in years three, five and seven took part in the study. This resulted in fifty-seven year three pupils, fifty-nine year five pupils and eighty year seven pupils. None of the pupils in the population had experienced formal classroom work with drawing free recall sketch maps. The study was centred around two dependent variables and ten independent variables.

The two dependent variables in the study were based on pupils' free recall sketch maps. The dependent variables were free recall sketch maps of the schoolground and of the local road intersection opposite the schoolground. The two draw-a-map tests centred on asking the pupils to draw a free recall sketch map of a common, familiar, meso sized area. The pupils were taken for a slow walk which circumnavigated the area to be mapped, before each of the two tests. This walk was designed to make the pupils feel at ease with the task and to reduce the memory factor for the map, as much as possible. The free recall sketch map of the schoolground was the first test given to the pupils, while the free recall sketch map of the local road intersection was the last test given to the pupils.

The first objective of the study was to describe, analyze and display the free recall sketch maps of pupils within each of these years. Therefore, the free recall sketch maps in the study had to be quantitatively scored to achieve the purpose and first objective, as well as the other objectives. A review of the literature showed that no suitable map reasoning level scale existed for use with free recall sketch maps. In fact, no quantitative method of scoring free recall sketch maps had been used to date.

A quantitative method of scoring maps drawn of a model landscape developed by Snyder, Feldman and La Rossa (1975) was the basis of the method for scoring the free recall sketch maps in this study. The levels of spatial reasoning development as revealed in map drawing developed by Snyder, Feldman and

La Rossa was presented in Table 1. Also, the spatial concepts and feature clusters used in scoring drawn maps developed by Snyder, Feldman and La Rossa was presented in Table 2.

The scoring scheme in this study was adapted from the works of Snyder, Feldman and La Rossa, especially the works presented in Tables 1 and 2, and centred on the four elements of a map. The four elements of a map were arrangement, proportion, perspective and abstraction/symbolization. Each of the four elements of a map had six levels of map reasoning developed from the works of Piaget and Inhelder (1956). Each free recall sketch map received four scores, one score for each map element. Each score was at one of the six map reasoning levels. The mean score of the four map reasoning level scores, i.e. the four map elements, was the overall map score. The scoring schemes for the four map elements are presented in Appendix A.

The procedures for scoring the free recall sketch maps was in two periods. The two periods were:

1. *Training Period*

Two professional geographic educators acted as independent judges for scoring the maps. The two judges underwent a training period in map scoring before commencing. The free recall sketch maps from a pilot study were used in the training period.

Each judge was given an accurate map of the pilot study school and the score sheets for arrangement, proportion, perspective and abstraction/symbolization. The criteria for each of the six levels, on the four score sheets were discussed in depth with relation to the accurate map of the schoolground.

Each judge was given one of the free recall sketch maps of the schoolground from the pilot study. The maps were independently scored, then the four map element scores were discussed in depth. Each judge was given photocopies of five free recall sketch maps of the schoolground from the pilot study. The maps were independently scored, then the four map element scores, for each map, were discussed in depth. This procedure continued until twenty maps had been scored.

The scores by the independent judges for the twenty maps yielded an interrater reliability of ·94, against the criterion ·80. This reliability indicated that the two judges were generally consistent with each other.

2. *Map Scoring*

All the maps of the schoolground were photocopied to ensure anonymity, randomly assigned a number, then randomly shuffled to integrate the three year levels. The first forty-nine maps, which were approximately twenty-five per cent of the total, were given to each judge to score. The judges worked at home and had no personal contact regarding the maps.

The scores by the independent judges for the first forty-nine maps of the schoolground yielded an inter-rater reliability of ·91. This reliability figure indicated that the two judges were again generally consistent. The scores for the first forty-nine maps were discussed in depth, especially the scores where the judges were in disagreement. The remaining one hundred and forty-seven maps were halved and then scored independently by the judges.

The free recall sketch maps of the local road intersection were scored then, following the same procedures for the free recall sketch map of the schoolground.

The ten independent variables in the study are based on a selected range of pupil attributes, within the area of mapping skills. The independent variables in the study are non-verbal I.Q., verbal I.Q., general ability, reading age, Iowa Test of Basic Map Skills, Feldman's Map Test Reasoning Level, Feldman's Map Test Score, socio-economic status, sex and age (within year levels).

The analysis of the data for the study is carried out and presented in two parts. Part one deals with the testing of the null hypotheses, while part two deals with the description, analysis and display of the free recall sketch maps.

The data in part one were analyzed using a univariate analysis of variance technique. The pupils in each year, for each independent variable were divided into three levels, for the analysis of variance with the draw-a-map measures. The three levels were a "lower" group, a "middle" group and an "upper" group. Because of the distribution of scores within each year, it usually was not possible to have equal blocks. Separate sets of analysis of variance were performed for the two dependent variables. Where significant differences occurred, *a posteriori* multiple comparisons were performed using the Tukey HSD Test. The subprogram ONEWAY of the Statistical Packages for the Social Sciences (SPSS) by Nie *et al.* (1975) facilitated these analyses.

The data, in part two, were analysed using the frequencies and descriptive statistics for the two dependent variables and the ten independent variables. The subprogram FREQUENCIES of the Statistical Packages for the Social Sciences (SPSS) by Nie *et al.* (1975) facilitated these analyses.

SUMMARY OF THE RESULTS OF THE STUDY

The results of the study are presented in two parts: (1) the testing of hypotheses associated with the two dependent variables; and (2) the description, analysis and display of the free recall sketch maps. A brief summary of these two sections is presented here.

1. The Testing of Hypotheses Associated with the Two Dependent Variables

This section presents a summary of the testing of each null hypothesis. An overall summary of the probabilities associated with each independent variable (hypothesis) on the two map measures at each year level is shown in Table 3. While, an overall summary of the significant independent variables on the two map measures at each year level is shown in Table 4.

Conclusions are drawn and are presented at the end of the summary. The conclusions are numbered to correspond with each hypothesis for ease and continuity of presentation. The conclusions are:

Conclusion 1a. The non-verbal I.Q. factor identified groups of children in the same year level who were at different stages of map reasoning development.

Conclusion 1b. The non-verbal I.Q. factor predicted the extent of map reasoning that was expected among different ability groups within the same year.

Conclusion 2a. The general ability factor identified groups of children in the same year level who were at different stages of map reasoning development.

Table 4: SUMMARY OF SIGNIFICANT INDEPENDENT VARIABLES ON TWO MAP MEASURES AT EACH YEAR LEVEL

Independent Variable	Year Seven		Year Five		Year Three	
	Map of the School	Map of the Road Intersection	Map of the School	Map of the Road Intersection	Map of the School	Map of the Road Intersection
Non-Verbal I.Q.	S	S	S	S	-	-
Verbal I.Q.	S	S	S	S	-	-
Reading Age	S	S	ns	S	S	S
General Ability	-	-	-	-	S	S
Iowa Map Test	S	S	S	S	-	-
Feldman R.L.	S	S	ns	ns	ns	ns
Feldman M.S.	S	S	S	S	ns	S
S.E.S.	ns	ns	ns	ns	ns	ns
Sex	ns	ns	ns	ns	ns	ns
Age	ns	ns	ns	ns	ns	ns

S significant at .05 level

ns not significant

Table 3: SUMMARY OF PROBABILITIES ASSOCIATED WITH EACH INDEPENDENT VARIABLE (HYPOTHESIS) ON TWO MAP MEASURES AT EACH YEAR LEVEL

Independent Variable (Hypothesis)	Year Seven		Year Five		Year Three	
	Map of the School	Map of the Road Intersection	Map of the School	Map of the Road Intersection	Map of the School	Map of the Road Intersection
Non-Verbal I.Q.	.001*	.001*	.01*	.01*	-	-
Verbal I.Q.	.01*	.01*	.01*	.01*	-	-
Reading Age	.01*	.01*	.17	.05*	.05*	.05*
General Ability	-	-	-	-	.01*	.0001*
Iowa Map Test	.001*	.05*	.05*	.05*	-	-
Feldman R.L.	.0001*	.01*	.25	.07	.26	.36
Feldman M.S.	.001*	.01*	.05*	.05*	.09	.05*
S.E.S.	.12	.06	.69	.42	.22	.29
Sex	.78	.80	.51	.63	.97	.35
Age	.13	.23	.51	.74	.30	.23

* Level of Significance

Conclusion 2b. The general ability factor predicted the extent of map reasoning that was expected among different ability groups within the same year.

Conclusion 3a. The verbal I.Q. factor identified groups of children in the same year level who were at different stages of map reasoning development.

Conclusion 3b. The verbal I.Q. factor predicted the extent of map reasoning that was expected among different ability groups within the same year.

Conclusion 4a. The reading age factor identified groups of children in the same year level who were at different stages of map reasoning development.

Conclusion 4b. The reading age factor predicted the extent of map reasoning that was expected among different ability groups within the same year.

Conclusion 5a. The Iowa Test of Basic Map Skills factor identified groups of children in the same year level who were at different stages of map reasoning development.

Conclusion 5b. The Iowa Test of Basic Map Skills factor predicted the extent of map reasoning that was expected among different ability groups within the same year.

Conclusion 6. There was inconsistent evidence as to the effect of the Feldman's Map R.L. factor on the level of pupils' map reasoning development

Conclusion 7. There was inconsistent evidence as to the effect of the Feldman's Map Score factor on the level of pupils' map reasoning development.

Conclusion 8. The socio-economic status factor was not a good indicator or predictor of the level of pupils' map reasoning development.

Conclusion 9. The sex factor was not a good indicator or predictor of the level of pupils' map reasoning development.

Conclusion 10. The age (within a year level) factor was not a good indicator or predictor of the level of pupils' map reasoning development.

2. The Description, Analysis and Display of the Free Recall Sketch Maps

Table 5 presents a summary of the mean scores of the four map elements, the map score and the difference between each score, for the two map measures, i.e. map of the school and map of the read intersection, within years seven, five and three.

Table 5 showed that for the map of the school measure, within each year, the rank of the map elements was in the order of perspective, abstraction, arrangement and proportion. For the map of the road intersection measure, the rank of the map elements was in the order of perspective, arrangement/abstraction (or abstraction/arrangement) and proportion.

Thus, for both the draw-a-map measures, within years seven, five and three, the perspective score was the highest and the proportion score was the lowest. This was interpreted as meaning that for both the free recall sketch maps, within each year, perspective was the easiest and proportion was the hardest.

Conclusion 11 is drawn from the summary of the mean scores of the four map elements — arrangement, proportion, perspective and abstraction — and the map score, i.e. the mean of the map elements for the two map measures, i.e. map of the school and map of the road intersection. The conclusion is:

Conclusion 11. The hierarchy of difficulty, i.e. hardest to easiest of the four elements of a map for pupils in the elementary school, when they draw a free recall sketch map was in the order of — proportion, arrangement, abstraction and perspective.

The difference between the map element scores and the map scores, i.e. mean of the four map element scores, within each year, indicated a consistent decrease from the map of the school measure, to the map of the road intersection measure. These differences were attributed to distancing, i.e. the separation between the map drawer and the area to be mapped. Distancing was

Table 5: SUMMARY: MEAN SCORES OF THE FOUR MAP ELEMENTS, THE MAP SCORE AND THE DIFFERENCE BETWEEN EACH SCORE FOR THE TWO MAP MEASURES WITHIN YEARS SEVEN, FIVE AND THREE

Year	Map	Map Elements				Map Score (Mean of Map Elements)
		Arrangement	Proportion	Perspective	Abstraction	
7	School	3.82	3.41	3.91	3.90	3.76
	Road Intersection	2.96	2.48	2.96	2.83	2.81
Difference		0.86	0.93	0.95	1.07	0.95
5	School	2.50	2.28	2.80	2.63	2.55
	Road Intersection	1.92	1.73	2.27	2.04	1.99
Difference		0.58	0.55	0.53	0.59	0.56
3	School	1.34	1.34	1.65	1.51	1.46
	Road Intersection	1.29	1.09	1.54	1.13	1.26
Difference		0.05	0.25	0.11	0.38	0.20

further evidenced by the mean difference between the map of the school score and the map of the road intersection score, which was ·20 in year three, ·56 in year five and ·95 in year seven.

Table 6 presents a summary of the categorization of the year seven, five and three pupils' maps, by the four map reasoning levels, for the two map measures, i.e. map of the school and map of the road intersection.

Table 6 showed that for the map of the school measure: fifty-five of the year three pupils were at a tautological or imaginative reasoning level with the remaining two pupils at a perceptual or associative reasoning level; thirty-two of the year five pupils were at a tautological or imaginative reasoning level with the remaining eighteen at a perceptual or associative reasoning level; and thirteen of the year seven pupils were at a tautological or imaginative reasoning level, twenty-three at a perceptual or associative reasoning level, seventeen at a concrete reasoning level and twenty-seven were at a formal reasoning level.

Table 6 also showed that for the map of the road intersection measure: fifty-seven of the year three pupils were at a tautological or imaginative reasoning level; fifty-one of the year five pupils were at a tautological or imaginative reasoning level with the remaining eight at a perceptual or associative reasoning level; and thirty-six of the year seven pupils were at a tautological or imaginative reasoning level, thirty-two at a perceptual or associative reasoning level, twelve at a concrete reasoning level and zero were at a formal reasoning level.

These results in Table 6 showed that elementary school pupils responded differently to situations which are isomorphic in a map reasoning sense, but, differed greatly in a perceptual or visual sense. The results showed that the map reasoning levels for the map of the road intersection measure were consistently lower than the map reasoning levels for the map of the school measure for all years. This was attributed to distancing, i.e. the separation between the map drawer and the area to be mapped.

Conclusion 12 is drawn from: (1) the summary of the mean scores of the four map elements, the map score and the difference between each score for the two map measures, i.e. map of the school and map of the road intersection; and (2) the categorization of the year seven, five and three pupils' maps by the

Table 6: SUMMARY: CATEGORIZATION OF THE YEAR SEVEN, FIVE AND THREE PUPILS' MAPS BY THE FOUR MAP REASONING LEVELS FOR THE TWO MAP MEASURES

Map Reasoning Level	Map Score Range	Map of the School						Map of the Road Intersection					
		Year						Year					
		7		5		3		7		5		3	
		N	Per cent	N	Per cent	N	Per cent	N	Per cent	N	Per cent	N	Per cent
1. Tautological	1.00-2.63	13	16.3	32	54.2	55	96.5	36	45.0	51	86.4	57	100.0
2. Perceptual	2.64-3.75	23	28.8	18	30.5	2	3.5	32	40.0	8	13.6	0	0.0
3. Concrete	3.76-4.50	17	21.3	9	15.3	0	0.0	12	15.0	0	0.0	0	0.0
4. Formal	4.50-6.00	27	33.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL: N		80	100.0	59	100.0	57	100.0	80	100.0	59	100.0	57	100.0

four map reasoning levels for the two map measures. The conclusion is:

Conclusion 12. The separation between the map drawer and the area to be mapped, i.e. distancing affected the ability of elementary school pupils to draw a free recall sketch map.

The relationship of the ability to draw a free recall sketch map, i.e. map reasoning level, with age, within years three, five and seven is shown graphically in Figure 2.

Figure 2 showed graphically that while age across the years was a good predictor of map reasoning level ($p < \cdot 00001$), age within years was not a good predictor of a pupil's map reasoning level. Figure 2 showed that the range of map reasoning levels increased with the year level. The range was from 1·00 to 3·50 for the year three pupils. The range increased for the year five pupils and was from 1·00 to 4·37. The range increased further for the year seven pupils and was from 1·00 to 5·75.

The free recall sketch maps of the schoolground by the year three pupils are displayed in Figures 4, 5, 6, 7; the maps by the year five pupils are displayed in Figures, 8, 9, 10, 11; and the maps by the year seven pupils are displayed in Figures 12, 13, 14, 15, 16, 17, 18. An accurate map of the schoolground is shown in Figure 3.

The free recall sketch maps by the year three pupils, Lee-Ann and David, by the year five pupil Darren, and by the year seven pupils Lino, Steven and Vanessa, indicated a very low map reasoning level. The arrangement and proportion appeared arbitrary with little or no logical correspondence to the reality of the schoolground. The horizontal perspective predominated, making these maps like pictorial representations, consisting mainly of idiosyncratic elements. Although, Vanessa had used a mixture of horizontal perspective, forty-five degree perspective and orthogonal projection, i.e. plan view. In all maps, there was very little evidence of the use of abstraction. David appeared to represent elements not related to the schoolground, but, Lee-Ann and Darren had attempted to represent some school elements, e.g. buildings, stairs, trees and the flag. Steven and Vanessa had attempted to show the arrangement of the school buildings as a U shape around a central quadrangle, but, Steven's attempt was very elementary. Vanessa's attempt roughly corresponded to reality.

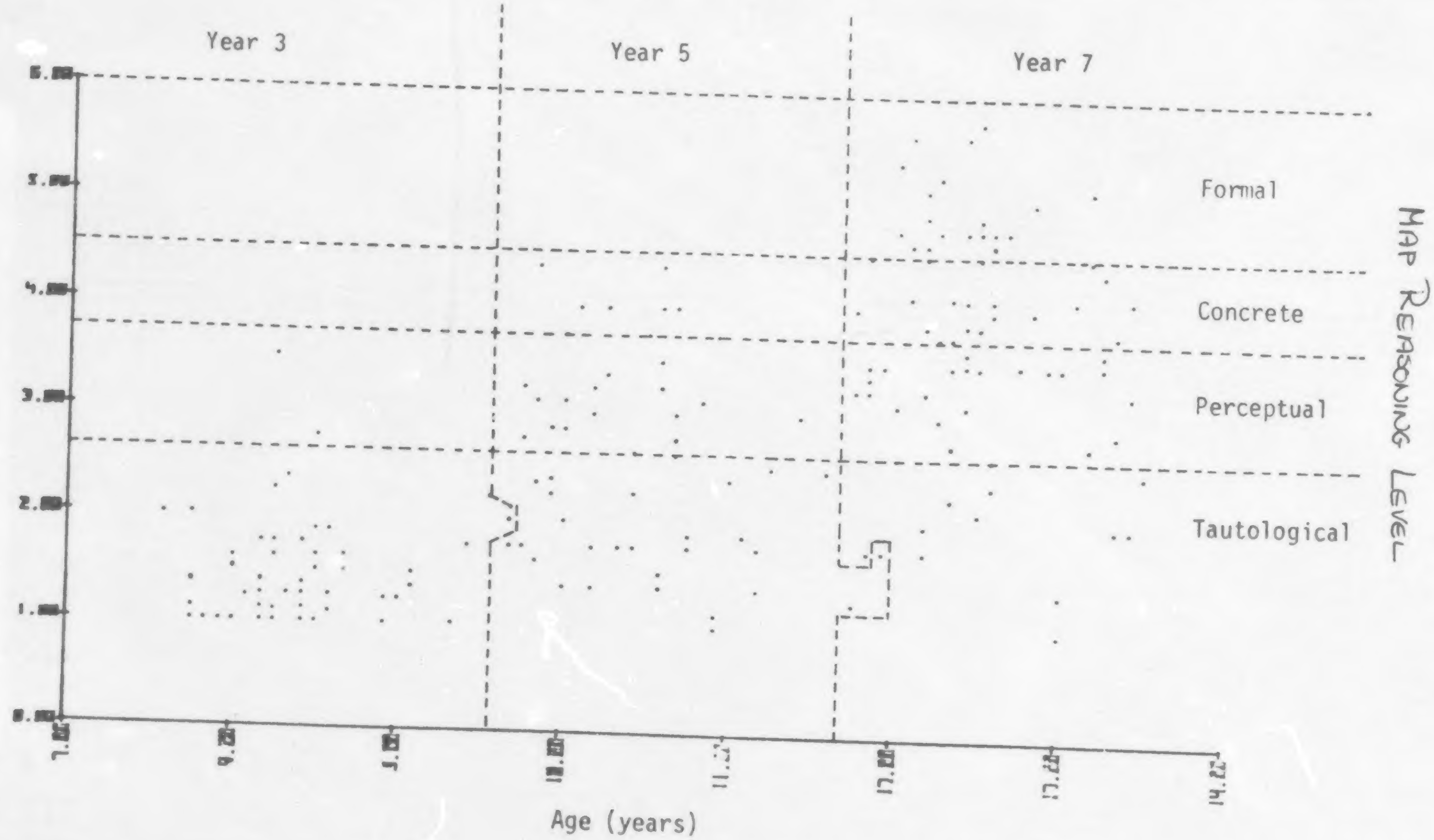

Figure 2: SUMMARY: SCATTERGRAM FOR YEAR SEVEN, FIVE AND THREE PUPILS — MAP REASONING LEVEL X AGE

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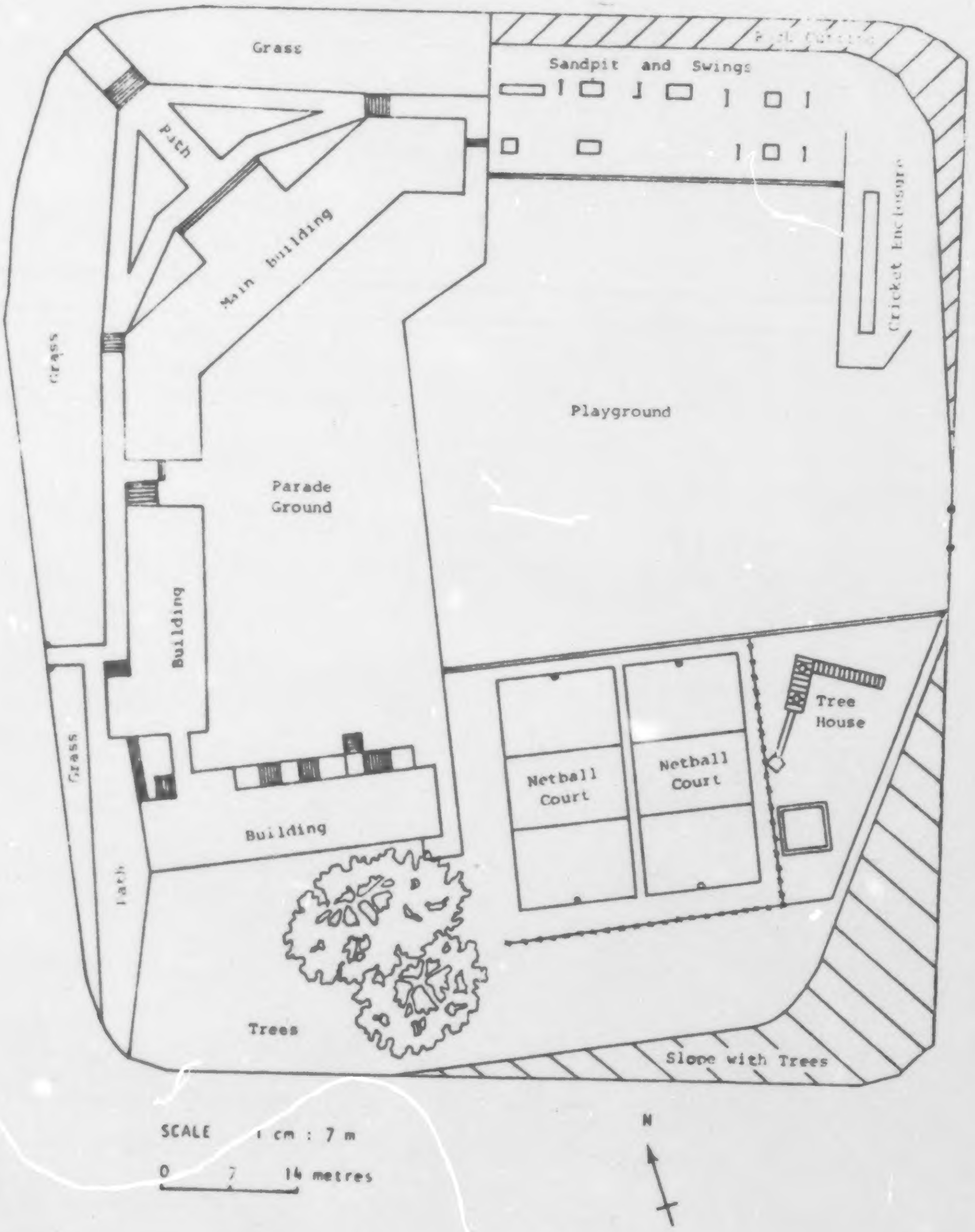
Grass
Sandpit and Swings
Path
Main building
Cricket Enclosure
Grass
Playground
Parade Ground
Building
Tree House
Netball Court
Netball Court
Grass
Building
Path
Trees
Slope with Trees
SCALE 1 cm : 7 m
0 7 14 metres
N

Figure 3: MAP OF THE SCHOOLGROUND

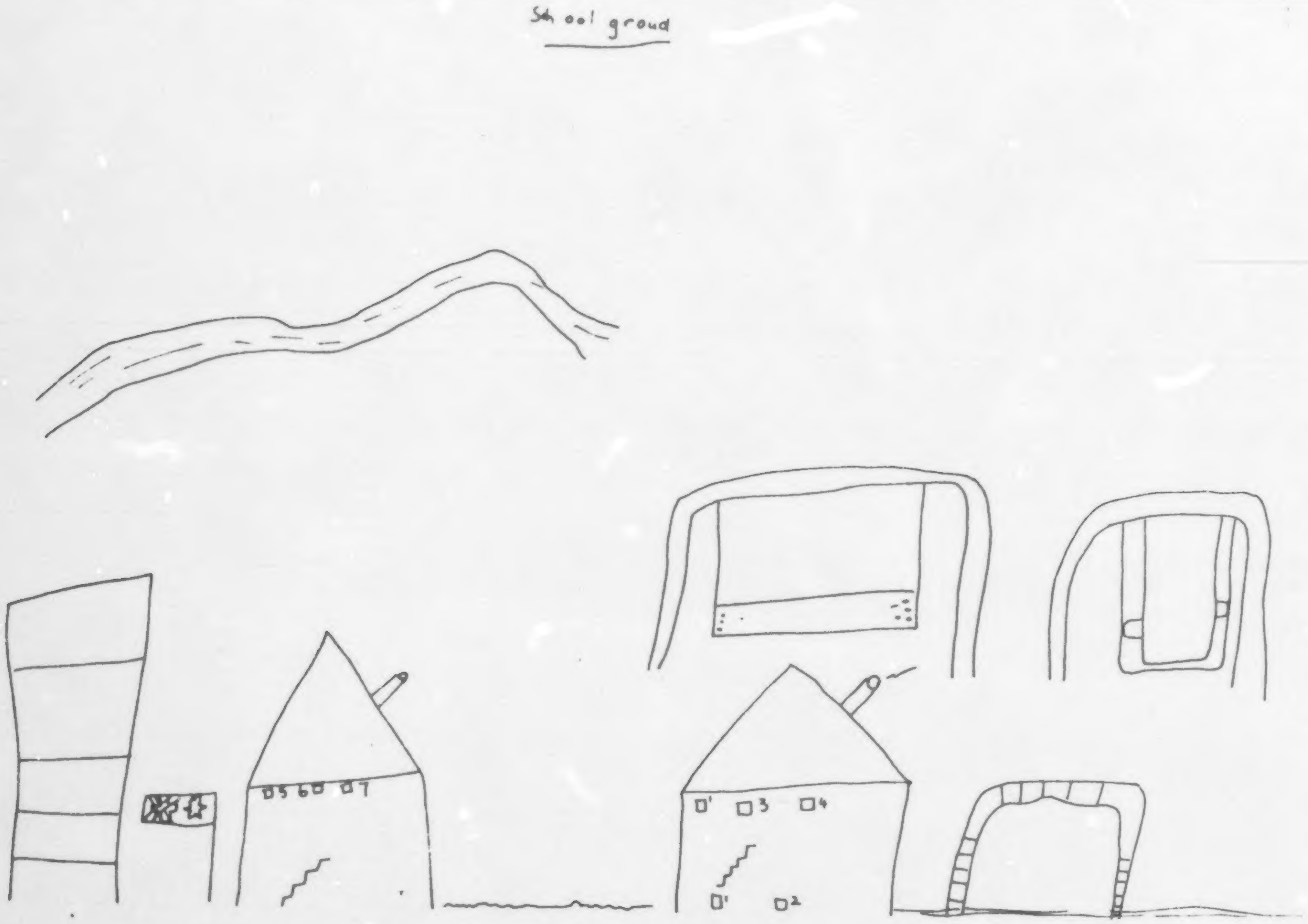
School groud
5 6
7
1
3
4
1
2

Figure 4: MAP OF THE SCHOOL BY LEE-ANN — YEAR 3, AGE 8 YRS 1 MTH, MAP SCORE 1·00

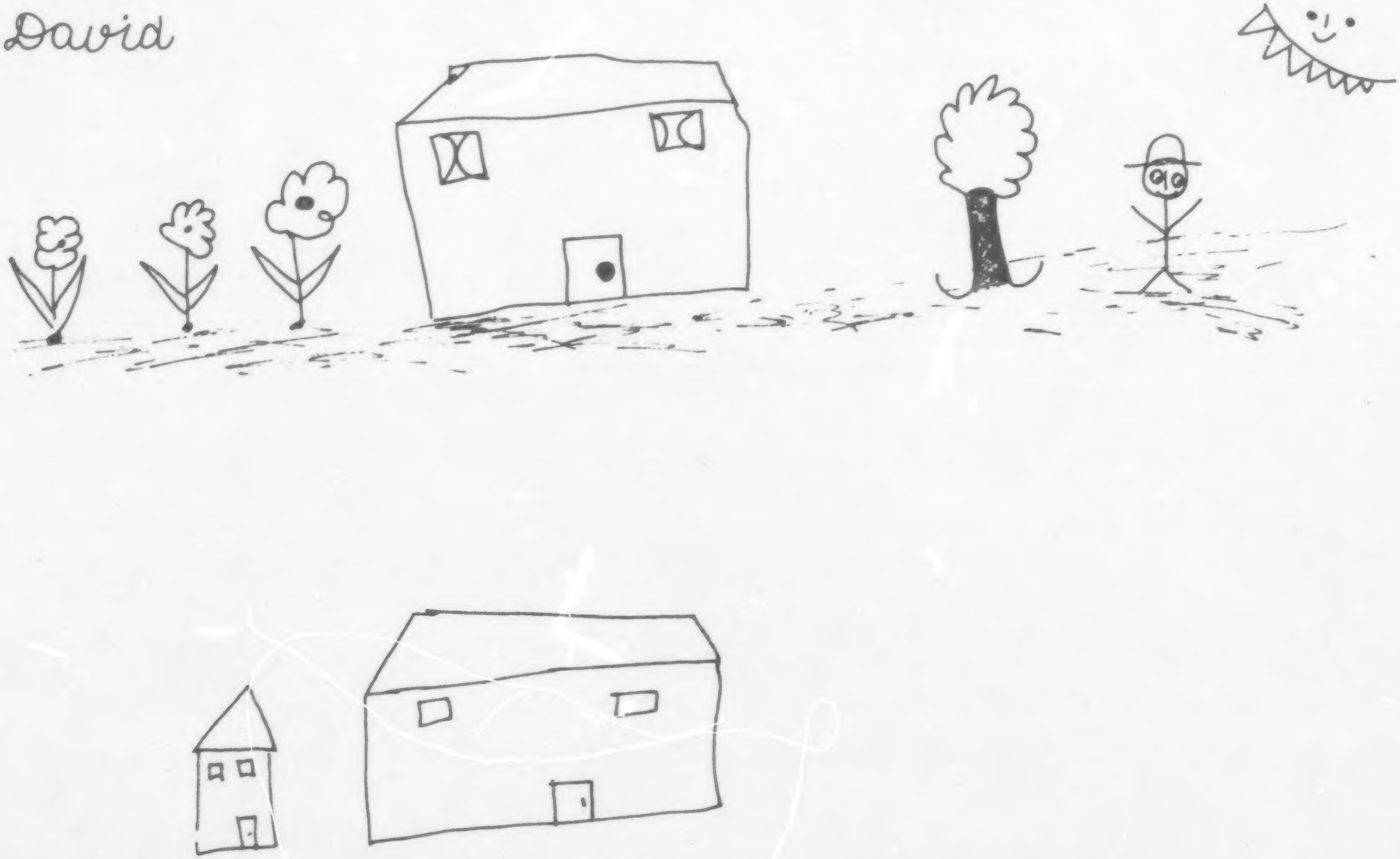

Figure 5: MAP OF THE SCHOOL BY DAVID — YEAR 3, AGE 8 YRS 2 MTHS, MAP SCORE 1·25

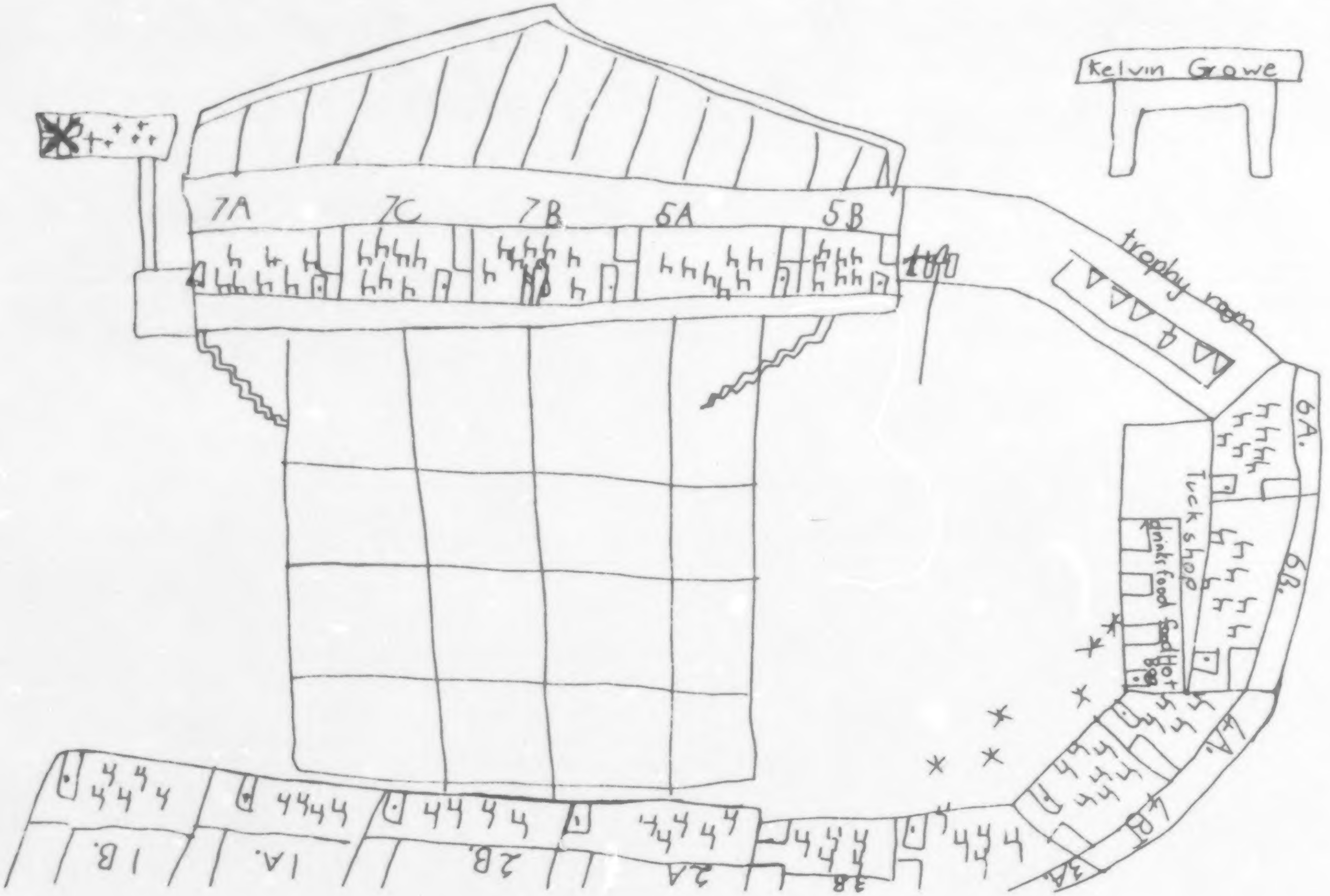
Kelvin Growe
7A
7C
7B
6A
5B
trophy room
6A.
Tuck shop
drinks food food Hot dog
6B.
4A.
4B
3A
3B
2A
2B.
1A.
1B.

Figure 6: MAP OF THE SCHOOL BY SAUL — YEAR 3, AGE 8 YRS 3 MTHS, MAP SCORE 2·25

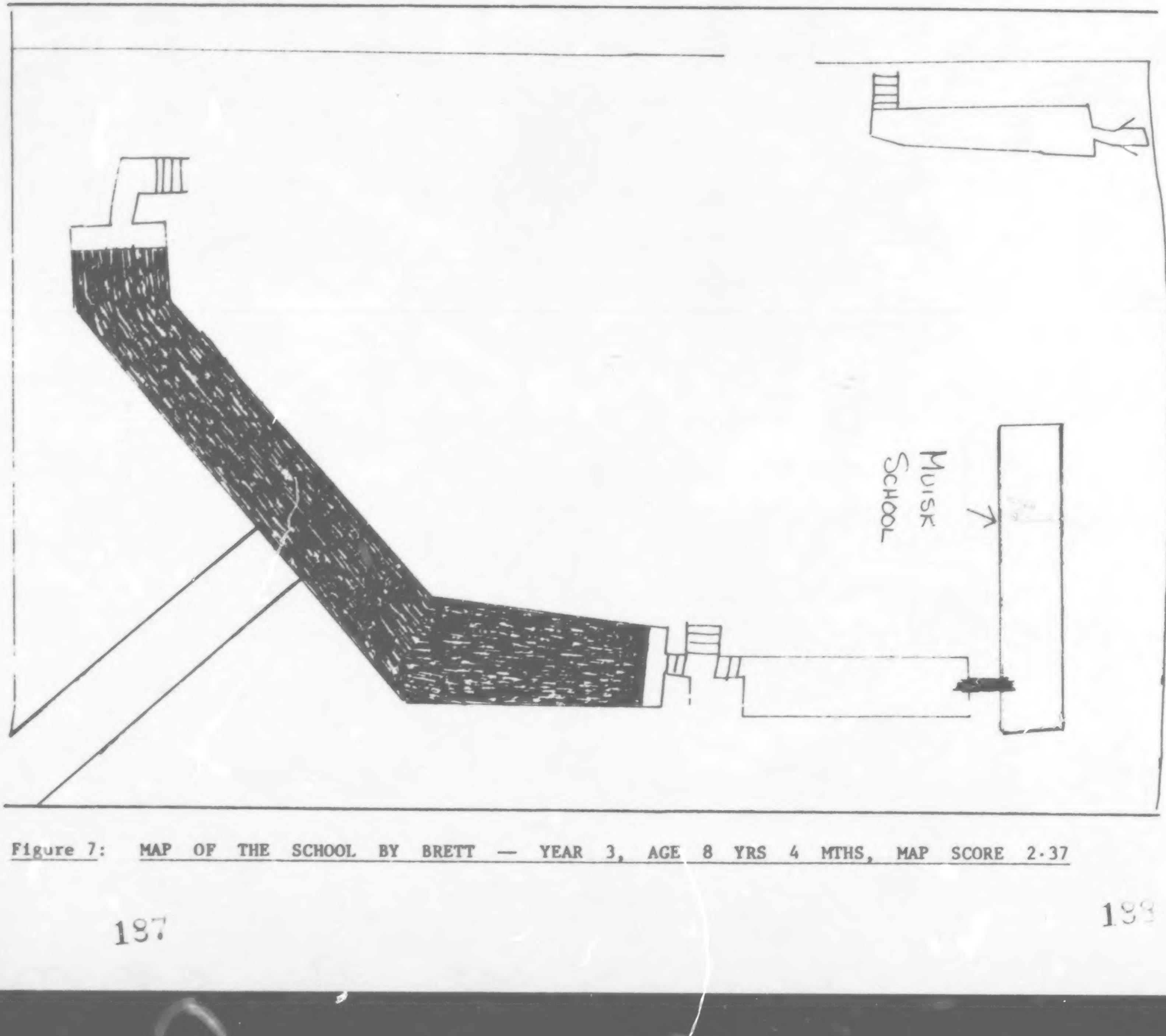
MUISK
SCHOOL

Figure 7: MAP OF THE SCHOOL BY BRETT — YEAR 3, AGE 8 YRS 4 MTHS, MAP SCORE 2·37

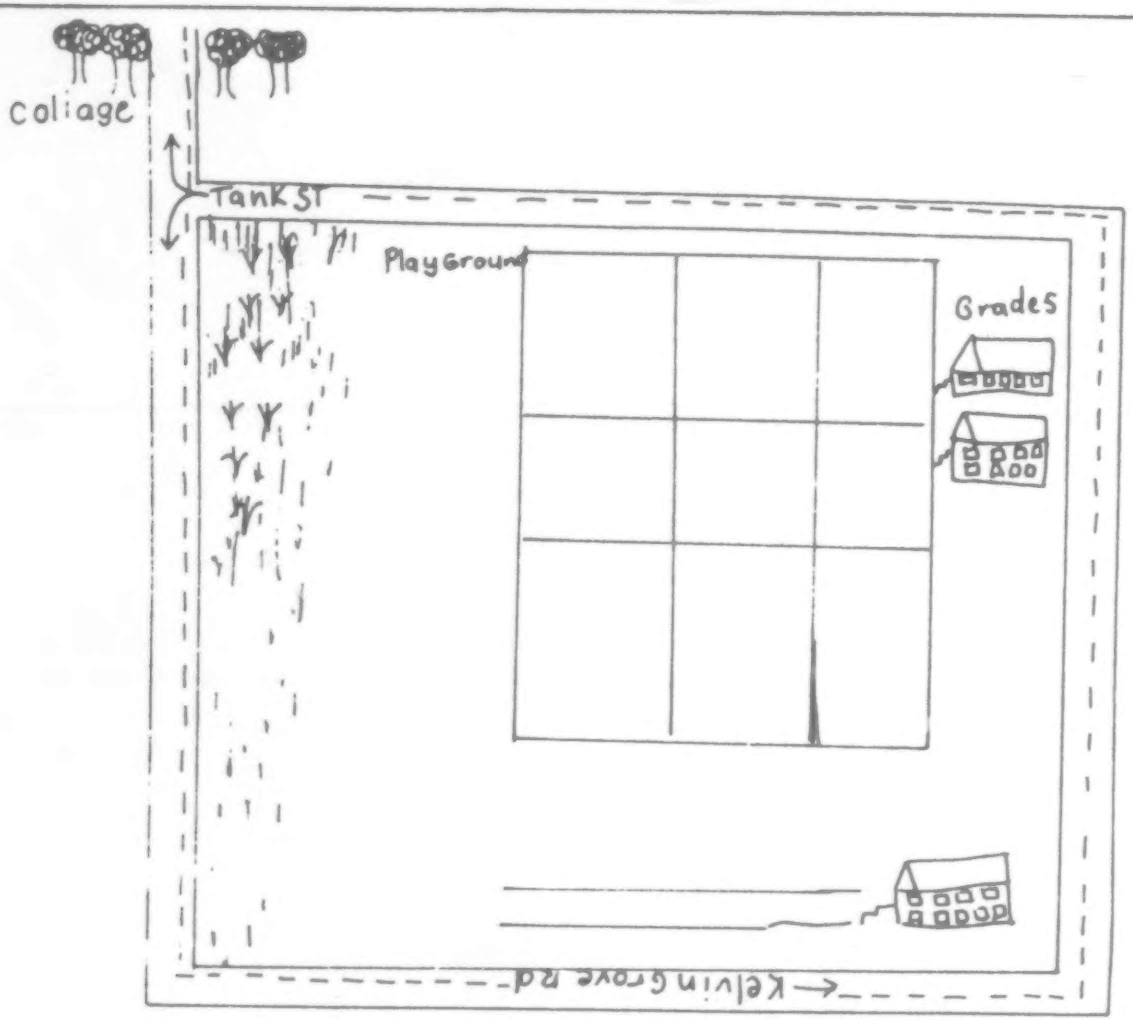
Coliage
Tank ST
Playground
Grades
Kelvin Grove Rd

Figure 8: MAP OF THE SCHOOL BY DARREN — YEAR 5, AGE 10 yrs 7 MTHS, MAP SCORE 1·37

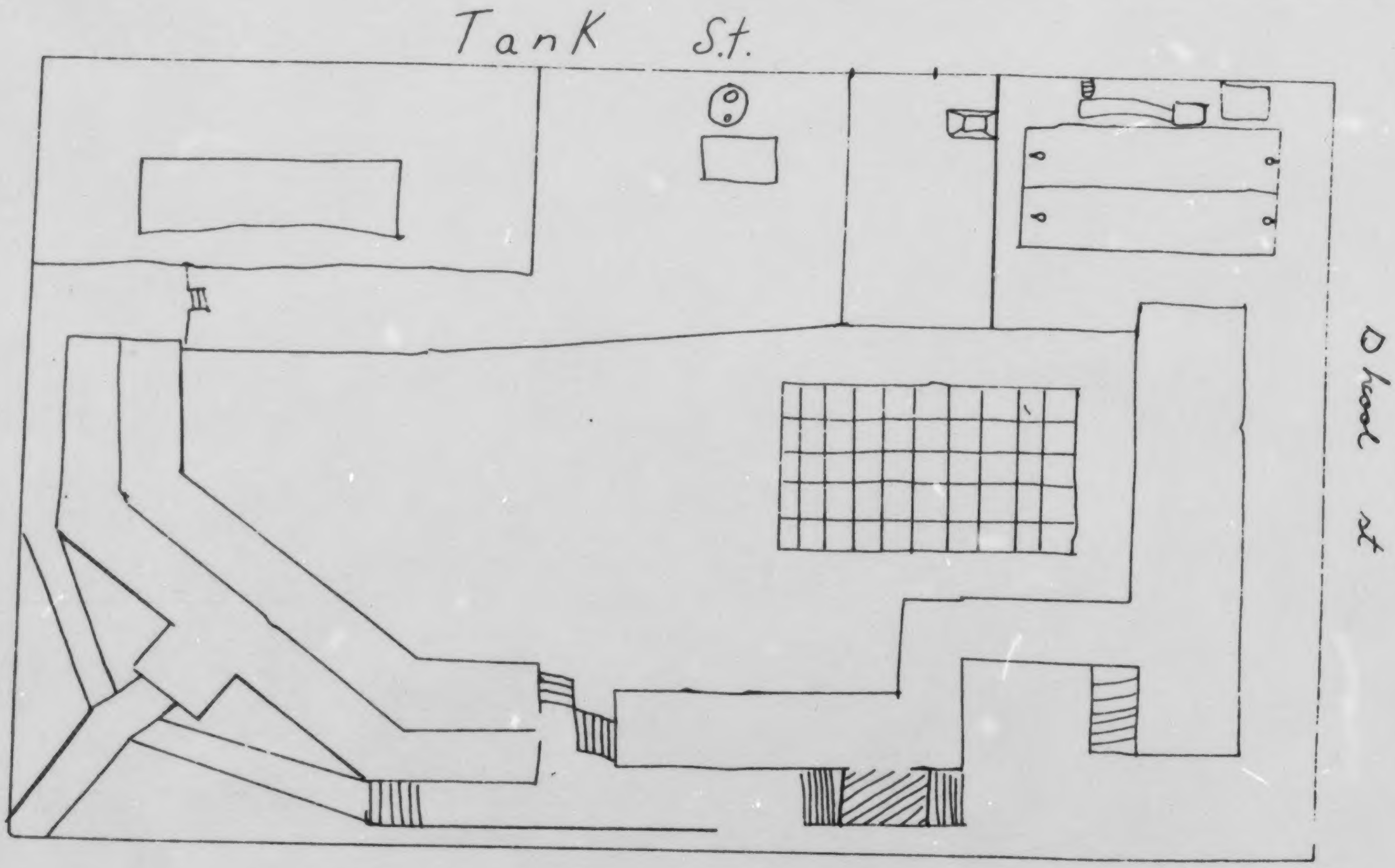
Tank St.
School st

Figure 9: MAP OF THE SCHOOL BY COREY — YEAR 5, AGE 10 YRS 11 MTHS, MAP SCORE 3·75

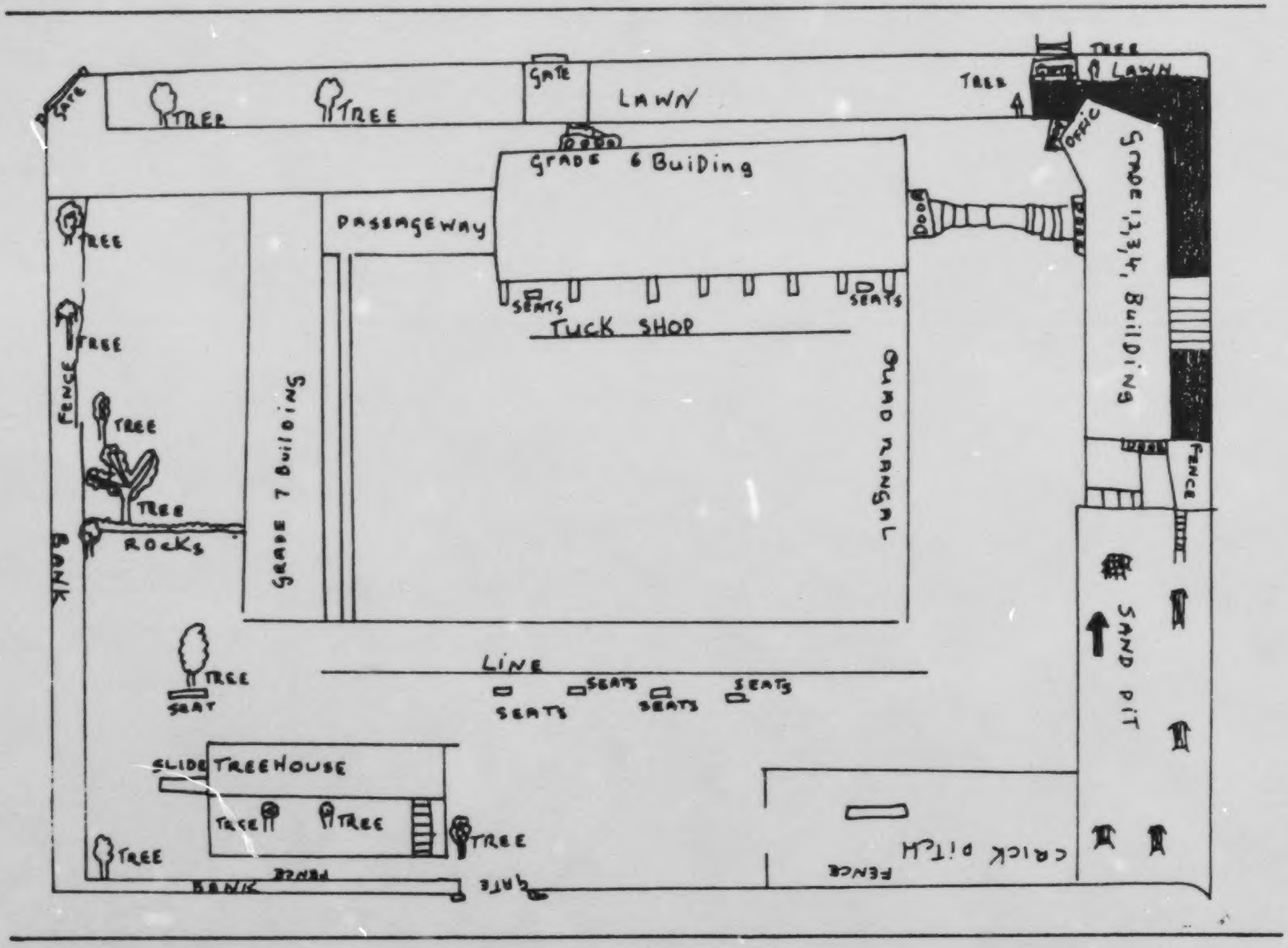
GATE
TREE
TREE
GATE
LAWN
TREE
TREE
LAWN
DOOR
GRADE 6 BUILDING
OFFIC
GRADE 1,2,3,4, BUILDING
DOOR
PASSAGEWAY
TREE
TREE
FENCE
TREE
TREE
ROCKS
BANK
GRADE 7 BUILDING
SEATS
SEATS
TUCK SHOP
QUAD RANGAL
FENCE
SAND PIT
LINE
TREE
SEAT
SEATS
SEATS
SEATS
SEATS
SLIDE
TREEHOUSE
TREE
TREE
TREE
TREE
BANK
FENCE
GATE
FENCE
CRICK PITCH

Figure 10: MAP OF THE SCHOOL BY KIM — YEAR 5, AGE 10 YRS 3 MTHS, MAP SCORE 4·00

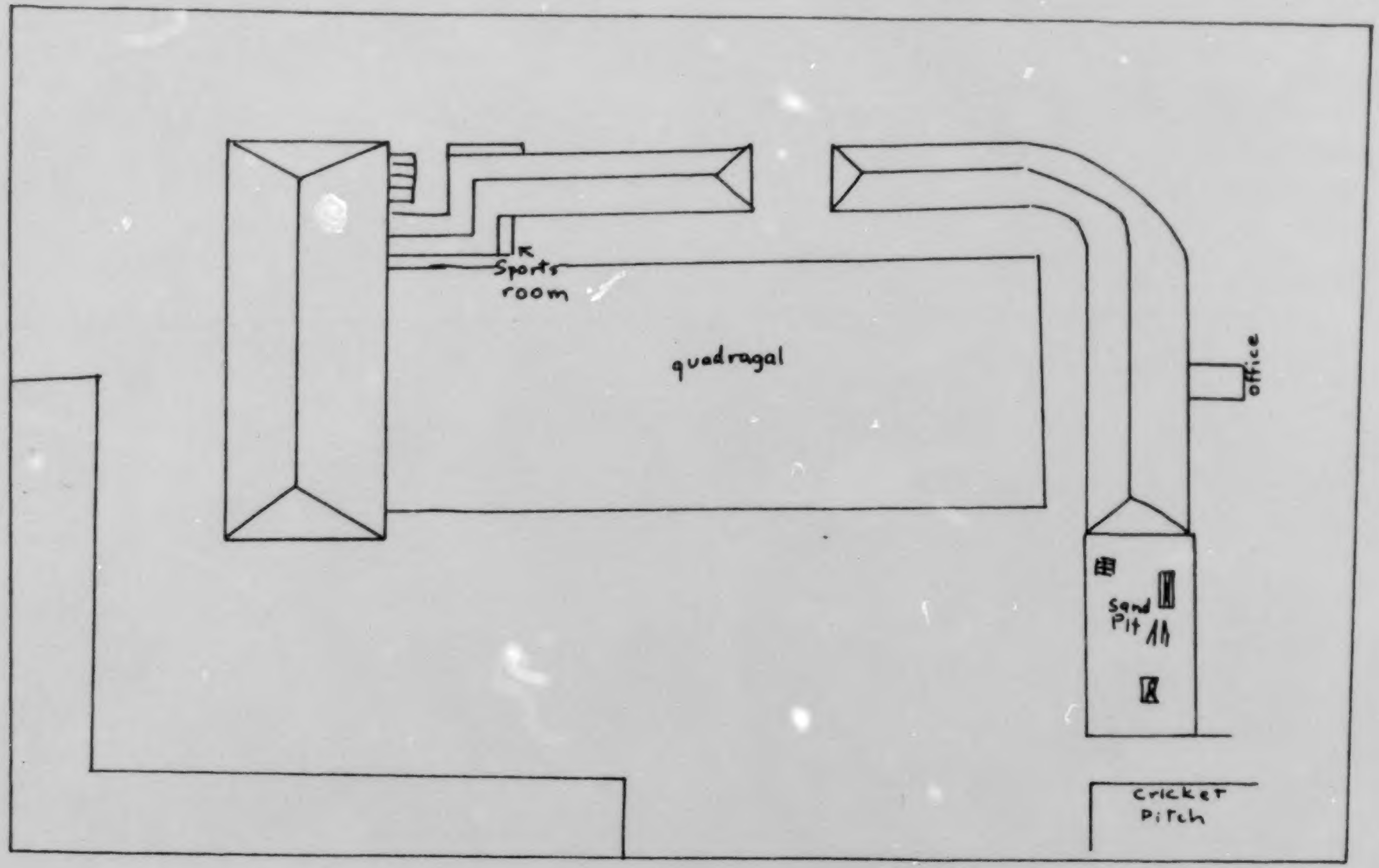
Sports room
quadragal
office
Sand Pit
cricket Pitch

Figure 11: MAP OF THE SCHOOL BY ARISTO — YEAR 5, AGE 9 YRS 10 MTHS, MAP SCORE 4·37

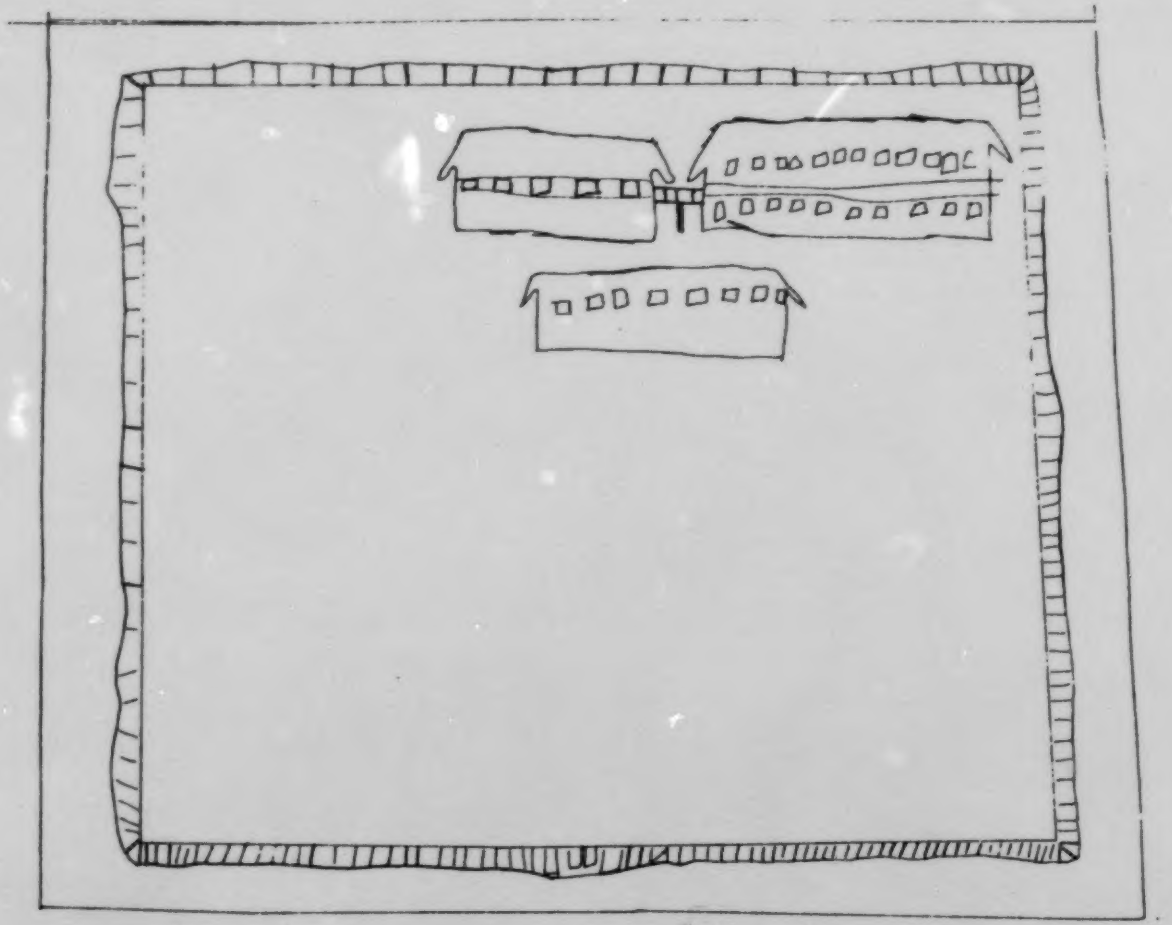

Figure 12: MAP OF THE SCHOOL BY LINO — YEAR 7, AGE 13 YRS 0 MTHS, MAP SCORE 1·00

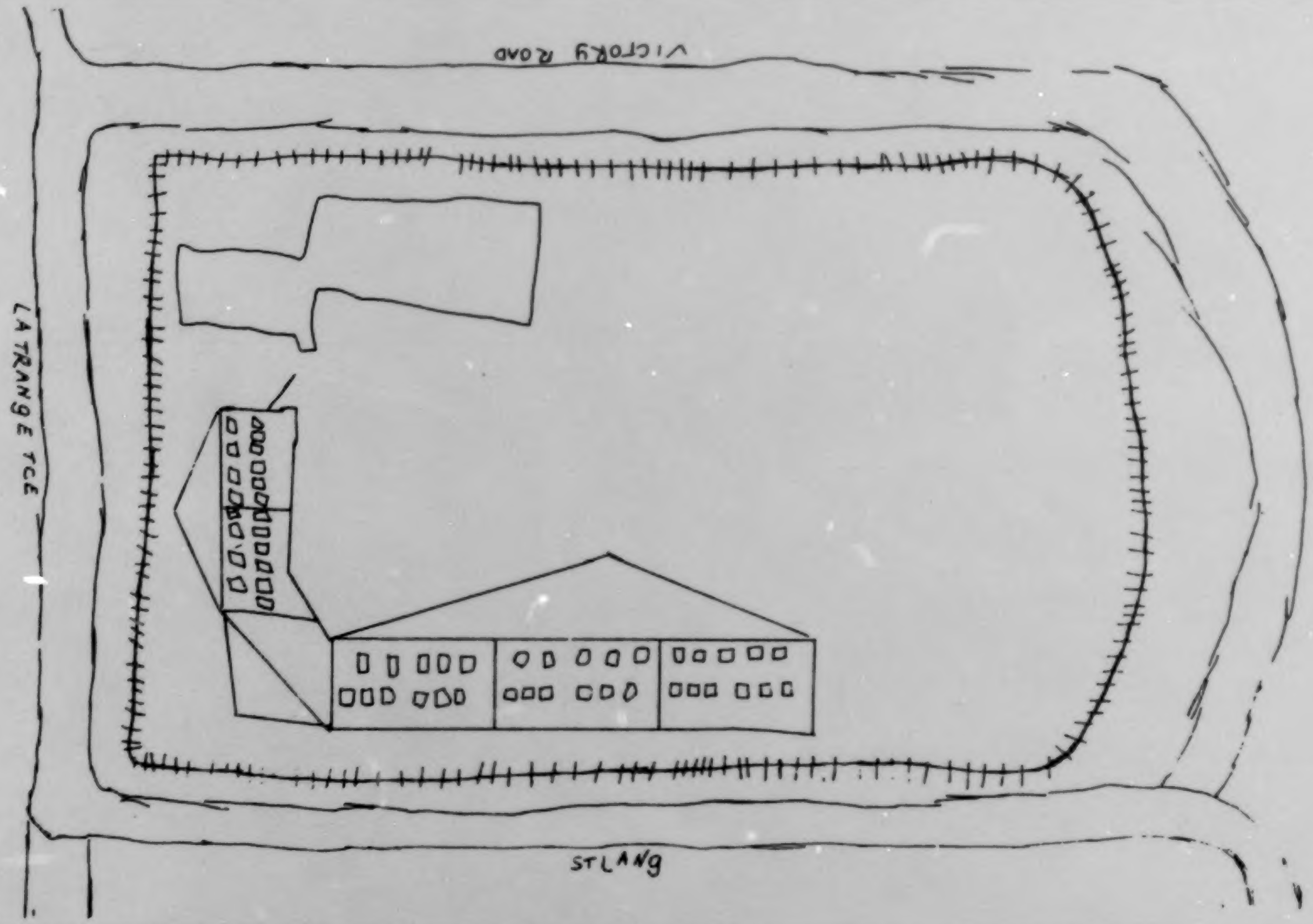
VICTORY ROAD
LA TRANGE TCE
ST LANG

Figure 13: MAP OF THE SCHOOL BY STEVEN — YEAR 7, AGE 12 YRS 2 MTHS, MAP SCORE 1·75

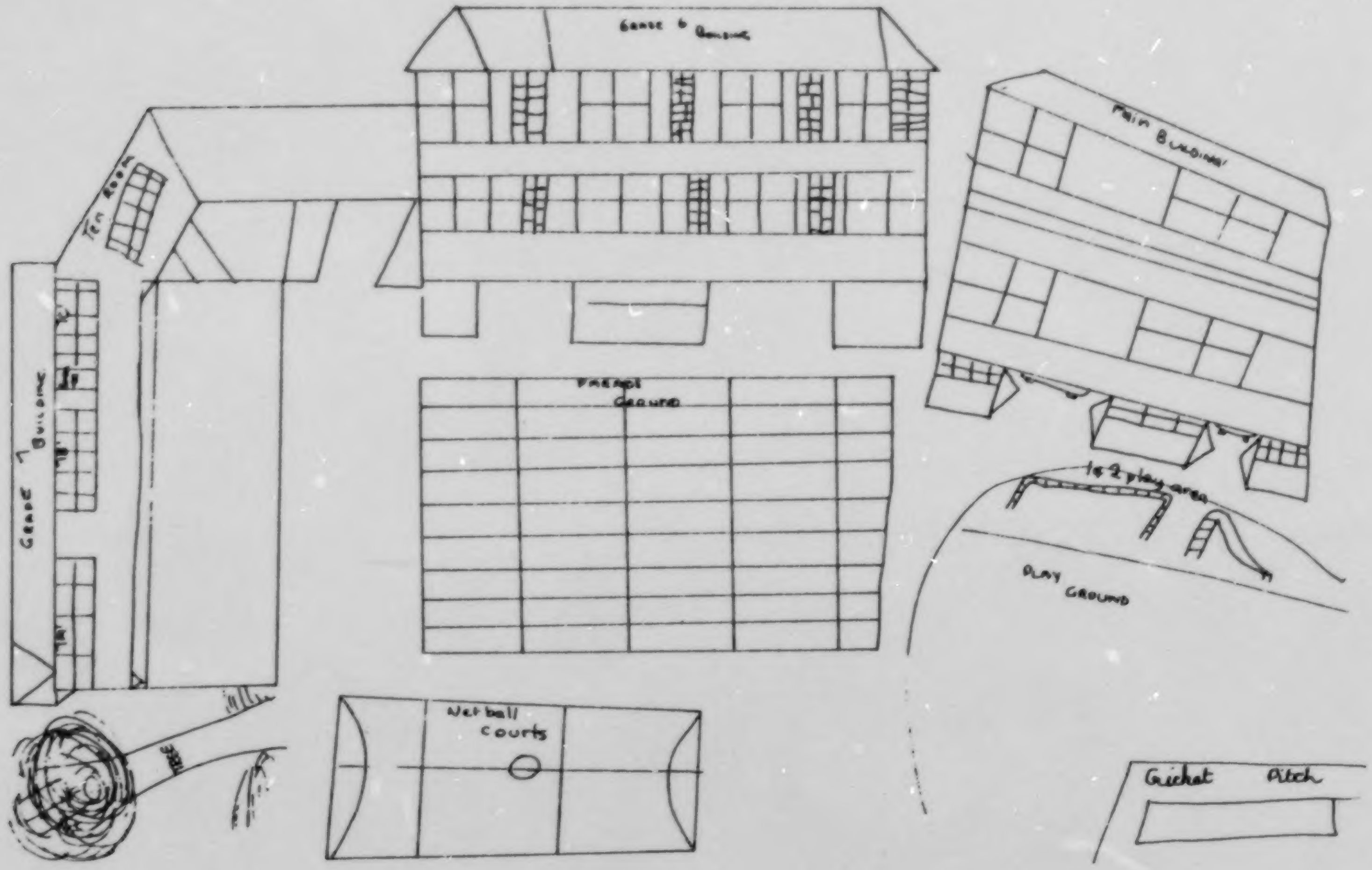
GRADE 6 BUILDING
MAIN BUILDING
TEA ROOM
GRADE 7 BUILDING
PARADE GROUND
1 & 2 play area
PLAY GROUND
TREE
Net ball courts
Cricket Pitch

Figure 14: MAP OF THE SCHOOL BY VANESSA — YEAR 7, AGE 12 YRS 3 MTHS, MAP SCORE 3·00

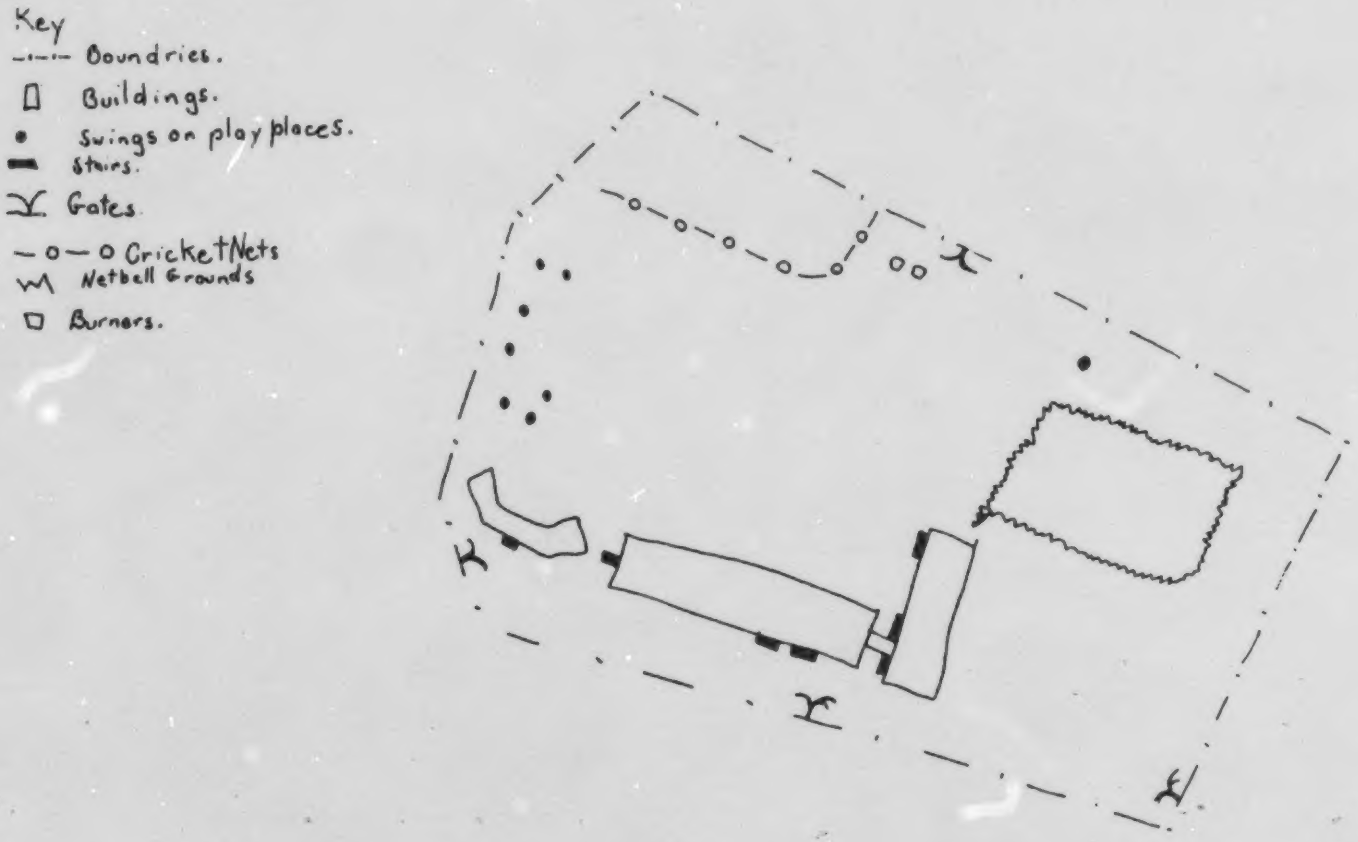
Key
Boundries.
Buildings.
Swings on play places.
Stairs.
Gates
CricketNets
Netball Grounds
Burners.

Figure 15: MAP OF THE SCHOOL BY EARL — YEAR 7, AGE 13 YRS 0 MTHS, MAP SCORE 3·50

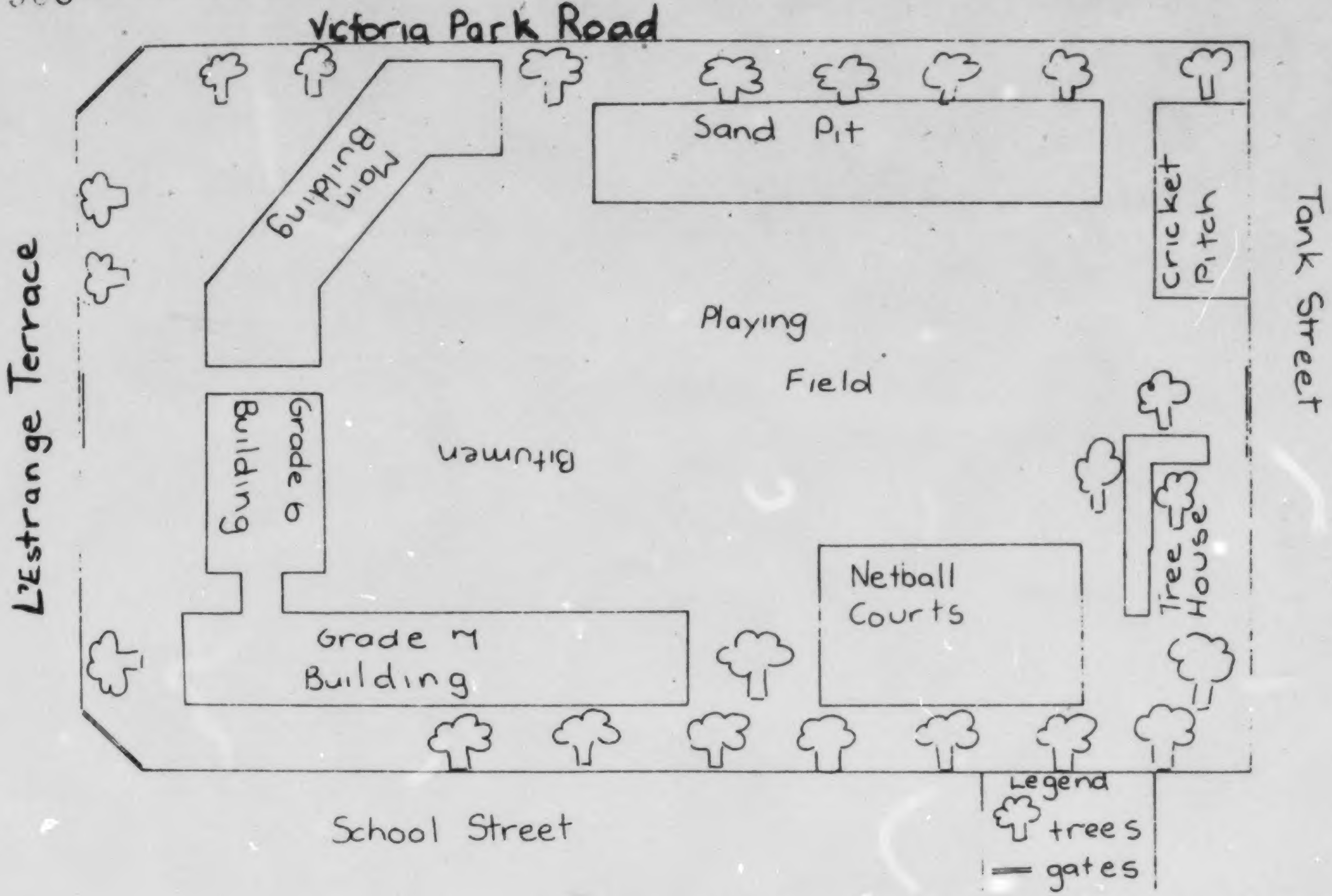
Victoria Park Road
Main Building
Sand Pit
Cricket Pitch
Tank Street
L'Estrange Terrace
Playing Field
Bitumen
Grade 6 Building
Tree House
Netball Courts
Grade 7 Building
School Street
Legend
trees
gates

Figure 16: MAP OF THE SCHOOL BY NARELLE — YEAR 7, AGE 12 YRS 1 MTH, MAP SCORE 4

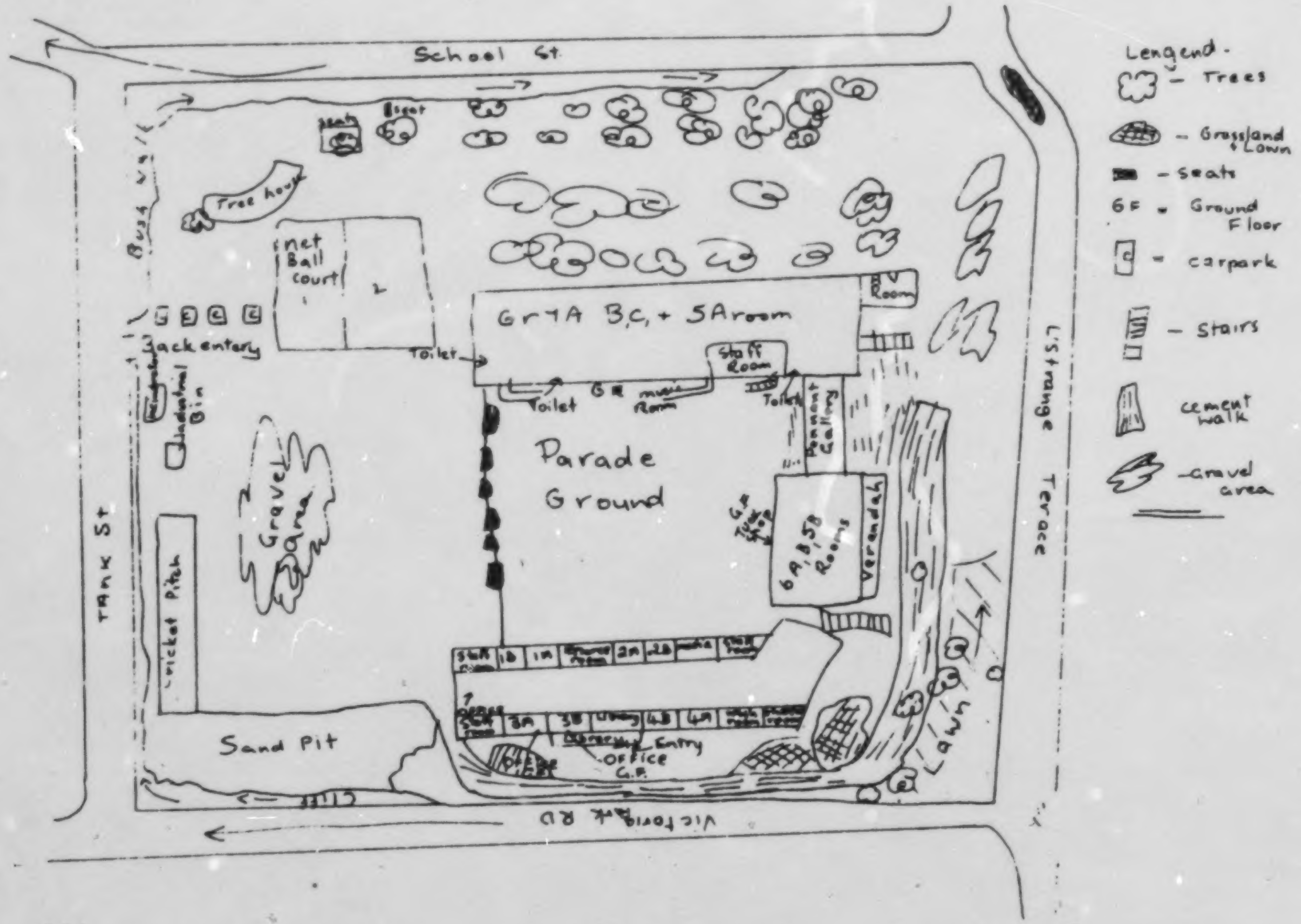
School St.
seat
seat
Bus Stop
Tree house
net Ball court 1
2
Back entery
Toilet
Gr 4A B,C, + 5A room
V Room
Staff Room
G F music Room
Toilet
Toilet
Industrial Bin
Gravel Area
Parade Ground
Permanent Gallery
G F Toilets
6A, B, 5B Rooms
Verandah
TRAK St
Cricket Pitch
Staff room
1B
1A
Science room
2A
2B
media
Staff room
Office
Staff room
3A
3B
Library
4B
4A
Sand Pit
Nursery
Entry
Office G.F.
Lawn
L'Strange Terrace
Victoria Pk RD
Lengend.
- Trees
- Grassland + Lawn
- seats
GF - Ground Floor
- carpark
- stairs
cement walk
- gravel area

Figure 17: MAP OF THE SCHOOL BY NOEL — Year 7, AGE 12 YRS 5 MTHS, MAP SCORE 5.62

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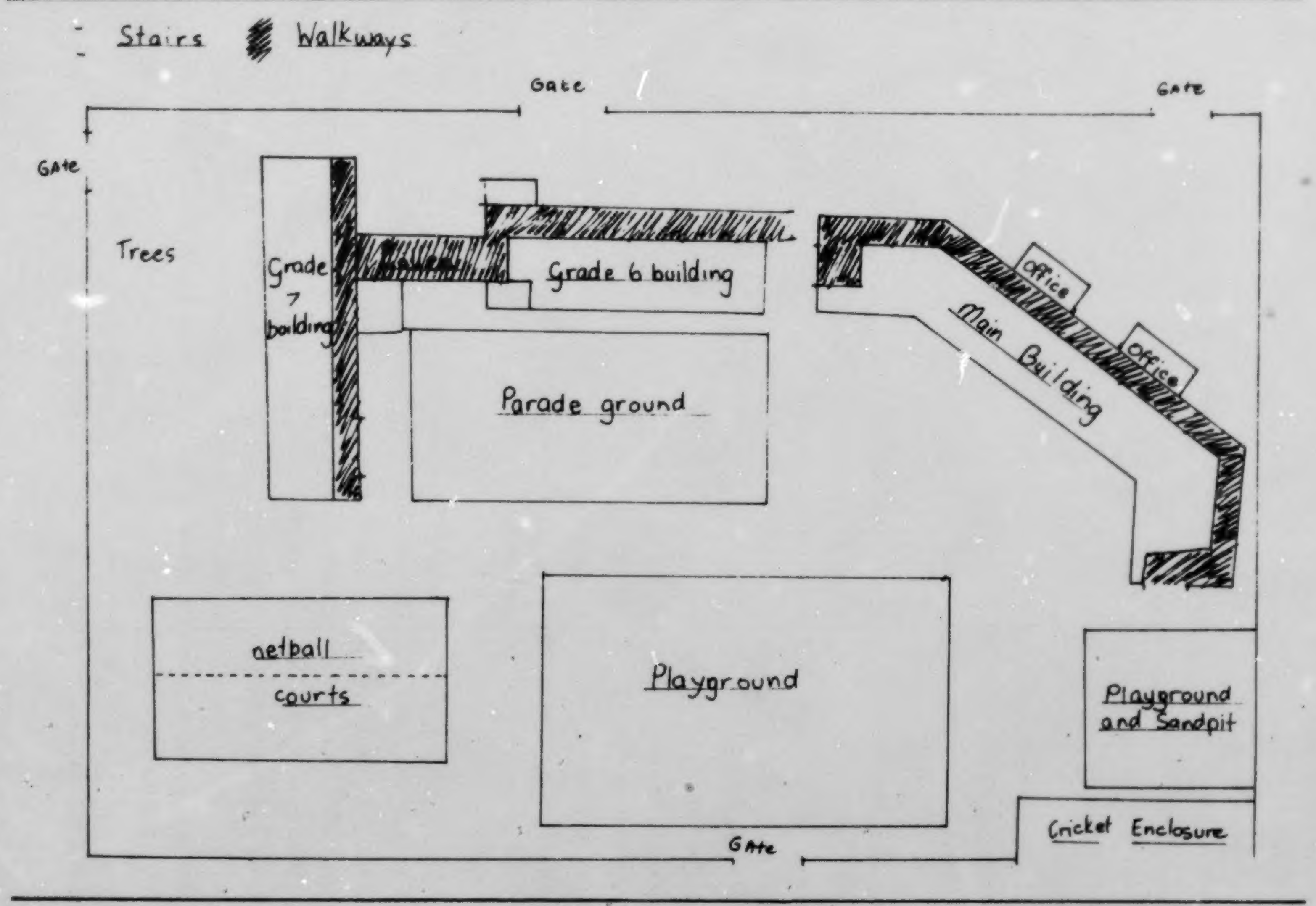
Stairs
Walkways
Gate
Gate
Gate
Trees
Grade 7 building
Grade 6 building
Main Building
office
office
Parade ground
netball courts
Playground
Playground and Sandpit
Cricket Enclosure
Gate

Figure 18: MAP OF THE SCHOOL BY CHRISTINE — YEAR 7, AGE 12 YRS 6 MTHS, MAP SCORE 5·75

The maps by the year three pupils, Saul and Brett, indicated a rudimentary map reasoning level. In Saul's map, the arrangement had some logical consistency, with the school buildings around a quadrangle, but, the recognizable proportion appeared to be based on the relative size of the objects, e.g. school rooms. Saul used an X-ray horizontal perspective to represent the buildings, filling most of the rooms with idiosyncratic features such as chairs, doors and blackboards. Brett had produced a legitimate two dimensional representation and as such, he had an understanding that a map needs an orthogonal projection, i.e. a plan view. The arrangement and proportion were generally consistent with the schoolground, but his use of abstraction was mainly pictorial as shown by his attempt to indicate that the music (muisk) room was underneath one of the school buildings.

The year five pupils Corey, Kim and Aristo had produced legitimate two dimensional representations of the schoolground. Each map was characterized by logical and numerical correspondence, with the objects on the map roughly related to the arrangement of the schoolground. Scaling was evident but inaccurate. The relative size of the objects on Corey's map were only roughly related to the relative size of the objects in the schoolground, Kim had a reasonable relationship, while Aristo approached accuracy. Each map had a consistent orthogonal projection, i.e. plan view, but Kim had minor intrusions of forty-five degree and horizontal perspective, with some idiosyncratic elements, e.g. trees and sand pit objects. All maps showed evidence of limited abstraction, but this was possibly due to the use of the orthogonal projection, i.e. plan view.

The year seven pupils Earl, Narelle, Noel and Christine had produced two dimensional, diagrammatic representations of the schoolground, characterized by complete coordination of the logical and numerical spatial correspondences. Earl had the objects in a recognizable, but poor, spatial correspondence to the schoolground, with the relative size of the objects only roughly related. Narelle, Noel and Christine had the objects in an accurate correspondence to the schoolground with proportions accurately related. Earl, Narelle, Noel and Christine had consistently used the orthogonal projection, i.e. plan view, and exclusively represented the objects of the schoolground with abstract symbols in conjunction with some form of legend.

Conclusions 13 and 14 are drawn from the summaries of the mean scores of the four map elements, the categorization of the pupils' maps by the four map reasoning levels and the analysis of the pupils' free recall sketch maps.

The conclusions are:

Conclusion 13. A free recall sketch map identified the level of map reasoning development of pupils in the elementary school.

Conclusion 14. A free recall sketch map predicted the extent of map reasoning that can be expected of pupils in the elementary school.

Although the inter-rater reliability for the two judges was consistently very high (> .90 approximately), it was difficult to ascertain what limitations may have been caused by the map scoring technique and procedures.

Because this study extended over a four to five week period, it was impossible to control day-to-day variations which could have had differential effects on the pupils. No allowance was made for the individual children's health or emotional states, the climatic variations or the time of the school day when the tasks were administered.

The implications from this study are drawn with the above limitations in mind. Also, generalizations are not drawn beyond this group of year three, five and seven pupils, at the particular school, at the particular time.

IMPLICATIONS FROM THE STUDY

This study provides several implications for further research, curriculum development and the classroom. These three aspects are reported separately together with appropriate recommendations.

IMPLICATIONS FOR FURTHER RESEARCH

The research of the developmental psychologists, Piaget and Inhelder (1956) has provided considerable knowledge of children's development in understanding space. It was noted in the Background to the Problem that Piaget and Inhelder (1956) felt they could find no better way of examining a child's spatial reasoning development than to have the child draw-a-map. Piaget and Inhelder suggested that this draw-a-map measure helped to determine whether the child was at a tautological of imaginative, perceptual or associative, concrete or formal level of spatial reasoning.

Blaut and Stea (1971: 392), Blaut, McLeary and Blaut (1970: 347), Boulding (1973: IX) and Dart and Lal Pradham (1967: 1653) had agreed with this statement by Piaget and Inhelder and also suggested that a free recall sketch may reveal a person's readiness to understand and use scientific abstractions. No previous researcher had investigated this concept despite the importance of this technique of using a free recall sketch map suggested by these authors.

The conclusions drawn from this study imply, however, that research into pupils' map reasoning development, in this case with respect to pupils' ability to draw a free recall sketch map must investigate a greater variety of concepts and must investigate these concepts in greater generality. This study implies that developmental psychologists could use the technique as a theoretical base for understanding certain aspects of the spatial reasoning development in children.

The study also implies that a child's level of map reasoning development, as revealed in a free recall sketch map is affected by the map user factors of non-verbal I.Q., verbal I.Q. and reading age. Also, there is no affect caused by sex, socio-economic status and age (within a given school year). Further research needs to test the effect of these variables and should be extended to cover as wide a range of other map user variables as is possible.

The results of the pupil's performance on the four elements of a map — arrangement, proportion, orthogonal projection and abstraction, i.e. cartographic language — pointed to the need for research to investigate these concepts in more generality. Investigations into these elements could help to clarify the key roles of the cartographer and the map user in the cartographic communication process. Also, the investigations could help to establish the viability of maps, atlases, globes, individual map skill activities and map sequence programmes within the classroom. These investigations would help to establish whether there is a hierarchy of map skills and whether they can be formulated into a sequence.

With these comments in mind the following recommendations for further research are presented. The recommendations are based on the findings and conclusions of this study and are not presented in any order of importance. The recommendations for further research are:

1. Further studies should replicate the present investigations of pupil's map reasoning development as revealed in free recall sketch maps, using different tasks and random samples of children.

2. Further studies should investigate the effect of a wide range of other variables, e.g. spatial ability, artistic ability, previous experience with maps, home environment, attitudes to maps, on the ability to draw a free recall sketch map.

3. Longitudinal studies should be carried out on a select group of children to chart their development of map reasoning through their years of formal education.

4. A wide range of studies should be undertaken to help clarify the key roles of the cartographer and the map user in the cartographic communication system.

5. Investigations should be carried out to establish whether there is a hierarchy of map skills and whether these can be formulated into a sequence.

6. Cartographers, map and atlas producers should investigate the role of the map user with their products.

IMPLICATIONS FOR CURRICULUM DEVELOPMENT

The research indicated that most authors regarded maps and mapping as an integral part of the social studies and geography curriculum and that maps and mapping skills should be functionally integrated within the curriculum. Also, it was noted that despite the importance of maps and mapping skills found in curriculum statements, there was limited and conflicting research evidence as to when and how to introduce maps and individual mapping skills.

Curriculum developers in social studies and geography usually include statements concerning the use of maps in the documents they prepare for teachers in the elementary and secondary schools. This study provides several implications from the findings and conclusions to assist future curriculum developers.

This study revealed to curriculum developers that map reasoning development, as revealed in free recall sketch maps was not significantly related to age (within a given school year) and as such, within any given year there are a range of pupils' map reasoning levels. Also, the study implies that as the year level at school increases, so does the range of the map reasoning levels. The study also revealed that non-verbal I.Q., verbal I.Q. and reading age had a significant effect on the pupil's map reasoning level.

Therefore, curriculum developers should consult with researchers in the area of cartographic education before curriculum statements are made. Specific curriculum statements should be related to pupils' map reasoning development and pupils' readiness for map work. A sequence of children's development in map reasoning should be included in curriculum statements. Statements should also alert teachers to the factors, e.g. non-verbal I.Q., verbal I.Q. and reading age, that affect map reasoning.

Curriculum developers should alert teachers to use map work materials commensurate with the pupil's map reasoning development and stress the need for individualized instruciton. Stress should be made in statements relating to map making rather than map reading. This stress should be emphasized seriously in relation to the early years of elementary school. This emphasis on map making could be facilitated by stressing the case of the four elements of a map — arrangement, proportion, orthogonal view and abstraction, i.e. cartographic language. This approach could serve as the basic introduction to maps and mapping.

With these comments in mind, the following recommendations for curriculum developers are presented. The recommendations are based on the findings and conclusions of this study and are not presented in any order of importance. The recommendations for curriculum development are:

1. Curriculum developers should take cognisance of the findings and conclusions of this study and incorporate these into the curriculum statements.

2. Curriculum developers should be cognisant of the differential rates of pupils' map reasoning development.

3. Curricula should include statements which make its readers aware that pupils' map reasoning development is influenced by a range of map user factors.

4. Curriculum developers need to determine what map work is most appropriate for elementary school children and when and how this should be taught.

5. Curriculum developers should not recommend any maps, map skill activities or map programmes until they have been evaluated by a cartographic education consultant.

IMPLICATIONS FOR THE CLASSROOM TEACHER

The findings and conclusions of this study contain a range of useful implications for the classroom, because they provide the classroom teacher with a range of insights into pupils' map reasoning development.

Under the headings of Implications for Further Research and Background to the Problem, it was noted that Piaget and Inhelder (1956) felt they could find no better way of examining a child's spatial reasoning development than to have the child draw-a-map. The findings and conclusions of this study imply for the classroom teacher that a free recall sketch map is a suitable device to determine whether a child is at a tautological or imaginative, perceptual or associative, concrete or formal level level of map reasoning and that it may reveal the child's readiness to understand and use scientific abstractions.

Teachers should be encouraged to assess the map reasoning level of their pupils using the free recall sketch map technique outlined in this study. The findings and conclusions in this study, relative to the level of map reasoning development, indicate that pupils within the same year level varied considerably. Also, as the year level at school increased, so the range of map reasoning levels within a given year, increased. This study showed, for example, that year seven pupils had a range of map reasoning levels from the lowest level to the highest level.

Teachers should be aware of these different levels of map reasoning when using any maps, globes, map skill activities or map programmes. The study implies that the use of heterogeneous groups, based on map reasoning levels, during map work could help overcome many of the misconceptions held by the weaker pupils. While, on the other hand, the use of homogeneous groups will allow groups to work at their own levels. Remedial work could be carried out with the lower groups, while the middle and upper groups could be challenged with higher levels of map reasoning activities.

This implies the need for cartographic learning experiences commensurate with the child's map reasoning level. The findings indicated that the majority of pupils in years three, five and seven were at, or below, the concrete reasoning level. Therefore, most of the map work in the elementary school should centre on concrete learning experiences. Teachers should use concrete learning experiences based on the four elements of a map — arrangement, proportion, orthogonal view, abstraction, i.e. cartographic language — to foster the development of pupils' map reasoning. These experiences must begin in kindergarten or year one and be based on objects in the classroom which are smaller than the child. This should gradually be extended to objects in the classroom which are larger than the child, then to experiences outside the classroom. The conclusions of this study imply that children need considerable and varied experiences, both inside and outside the classroom, with the four elements of a map to foster map reasoning development.

The study therefore implies that teachers in the elementary school should have a thorough knowledge and understanding of the cartographic language system, especially the role of the map user, the map author, and the dialogue between these two. Knowledge and understanding of this cartographic language system in association with an understanding of pupils' map reasoning levels will suggest to teachers that maps and map work in the classroom should be based on a careful sequence. Maps and map work in the early years of elementary school should cater for pupils at a concrete reasoning level, while maps and map work which cater for pupils at an abstract reasoning level should not be introduced until late in the years of elementary school, or even delayed until secondary school. This study implies a sequence of map types from vertical aerial photographs, preferably coloured then followed by black and white, through orthophotomaps to conventional and topographic maps.

One of the major conclusions of this study was that elementary school pupils responded differently to situations which are isomorphic in a map reasoning sense, but, which differed in a perceptual or visual sense. The results showed that the level of map reasoning for the map of the schoolground was significantly lower than the level of map reasoning for the map of the local road intersection. The study concluded that distancing, i.e. the separation between the map drawer and the area to be mapped, had a profound effect on the ability to draw a free recall sketch map, even though the situations appeared isomorphic. Teachers should be very aware of such perceptual and visual differences and offer a range of map drawing activities, which involve the four elements of a map — arrangement, proportion, orthogonal view, abstraction, i.e. cartographic language — in isomorphic situations.

Finally, the study implies that the factors of non-verbal I.Q., verbal I.Q., general ability, reading age and the Iowa Test of Basic Map Skills are good indicators and predictors of map reasoning levels. Also, the factors of socio-economic status, sex and age within a given year level are not good indicators of map reasoning levels. Teachers should be made very aware of how these factors affect map reasoning development and they should investigate how these factors affect pupils in their calsses. Teachers should be encouraged to carry out classroom research to investigate how these factors, as well as a wide range of other factors, affect the map reasoning development of their pupils.

With these comments in mind, the following recommendations for the classroom teacher are presented. The recommendations are based on the findings and conclusions of this study and are not presented in any order of importance. The recommendations for the classroom teacher are:

1. Teachers should take cognisance of the findings, conclusions and recommendations of this study and incorporate these into the classroom.

2. Teachers should be cognisant of the cartographic communication system and reflect this knowledge in their daily programmes and curricula.

3. Teachers should use the free recall sketch map technique to assess their pupils' level of map reasoning development and use this knowledge to cater for individual differences.

4. Teachers should be aware that maps, individual map skill activities and sequenced map programmes must suit the level of

map reasoning development of their pupils.

5. Teachers should ensure that maps, individual map skill activities and sequenced map programmes are functionally integrated into their daily programmes and curricula.

6. Teachers should use a wide range of sketch map activities, both inside and outside the classroom, to develop in their pupils a knowledge and understanding of the four basic elements of a map.

7. Teachers should be aware that numerous map user factors affect the map reasoning development of their pupils.

8. Teachers should be encouraged to carry out classroom research to investigate which map user factors affect the map reasoning development of their pupils.

CONCLUSION

The study investigated the map reasoning development of eight, ten and twelve year old pupils as revealed in free recall sketch maps. The investigation was an exploratory study into pupils' map reasoning development so, only one school was used. The population for the study consisted of 196 pupils. There were fifty-seven year three pupils, fifty-nine year five pupils and eighty year seven pupils. None of the pupils in the study had experienced formal classroom work with drawing free recall sketch maps.

The study centred around two dependent variables and ten independent variables. The dependent variables were free recall sketch maps of common, familiar, meso sized areas. The areas were the pupils' schoolground and the local road intersection opposite the schoolground. The ten independent variables were based on a selected range of pupil attributes, within the area of mapping skills. The independent variables were non-verbal I.Q., verbal I.Q., general ability, reading age, Iowa Test of Basic Map Skills, Feldman's Map Test Reasoning Level, Feldman's Map Test Score, socio-economic status, sex and age (within year levels). The analysis of the data was carried out and presented in two parts. Part one dealt with the testing of null hypotheses associated with the dependent and independent variables. An analysis of variance involving three blocks was used to test each hypothesis. Part two dealt with the description, analysis and display of the free recall sketch maps associated with the two dependent variables.

The study found, in part one, that non-verbal I.Q., verbal I.Q., general ability, reading age and the Iowa Test of Basic Map Skills identified pupils' level of map reasoning development and predicted the extent of map reasoning that was expected among different ability groups. Feldman's Map Test Reasoning Level and Feldman's Map Test Score provided inconsistent evidence as to their effect on the level of pupils' map reasoning development. Socio-economic status, sex and age (within year levels) were not good indicators or predictors of the level of pupils' map reasoning development.

The study found, in part two, that when pupils drew a free recall sketch map, proportion was the hardest map element followed by arrangement and abstraction, i.e. cartographic language, with perspective, i.e. orthogonal view the easiest map element. Also, the separation between the map drawer and the area to be mapped, i.e. distancing, affec[illegible]he ability of the elementary school pupils to draw a free recall sketch map. So, a free recall sketch map was a suitable device to identify and predict the level of map reasoning development of pupils in the elementary school.

The implications and recommendations from the study were not drawn beyond the particular group of year three, five and seven pupils, at the particular school, at the particular time. The study made six recommendations for further research, five recommendations for curriculum development and eight recommendations for the classroom teacher.

The knowledge gained from this study should be used to convince researchers, curriculum developers, classroom teachers and also cartographers that the map user is a vital element in the cartographic communication process. They should realize that pupils' map reasoning develops in different ways and at quite different rates.

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APPENDIX A

SCORING SCHEME FOR THE FREE RECALL SKETCH MAPS: ARRANGEMENT, PROPORTION, PERSPECTIVE AND ABSTRACTION/SYMBOLIZATION

ARRANGEMENT OF MAP

LEVEL 1	NO LOGICAL CORRESPONDENCE TO MODEL.	.....	SCORE 1
LEVEL 2	OBJECTS ARRANGED BY LOGICAL PROPERTIES AND/OR SMALL GROUP PROXIMITIES WITHOUT REFERENCE TO AN OVERALL SPATIAL PLAN, OFTEN WITH INACCURATE NUMERICAL CORRESPONDENCE, e.g. OBJECTS IN LINES, SIMILAR OR PROXIMAL ITEMS BUNCHED INAPPROPRIATELY, OBJECTS CLINGING TO SIDES OF PAPER, etc.	.....	SCORE 2
LEVEL 3	OBJECTS IN RECOGNISABLE, BUT POOR SPATIAL CORRESPONDENCE TO MODEL WITH ACCURATE NUMERICAL CORRESPONDENCE	.....	SCORE 3
LEVEL 4	OBJECTS ON MAP IN ROUGH CORRESPONDENCE TO MODEL ± 30%	.....	SCORE 4
LEVEL 5	OBJECTS ON MAP IN REASONABLE CORRESPONDENCE TO MODEL ± 20%	.....	SCORE 5
LEVEL 6	OBJECTS ON MAP IN ACCURATE CORRESPONDENCE TO MODEL ± 10%. IN CONJUNCTION WITH GOOD PROPORTION.	.....	SCORE 6

PROPORTION OF MAP

LEVEL 1	NO LOGICAL OR "REALISTIC" PROPORTION	.....	SCORE 1
LEVEL 2	RECOGNISABLE AND "REALISTIC" PROPORTION IN RELATIVE SIZE OF OBJECTS ON MAP WHICH IS, HOWEVER, NOT RELATED TO MODEL	.....	SCORE 2
LEVEL 3	RELATIVE SIZE OF ALL OBJECTS ON MAP ROUGHLY RELATED TO RELATIVE SIZE OF MODEL ± 30%	.....	SCORE 3
LEVEL 4	RELATIVE SIZE OF OBJECTS ON MAP REASONABLY RELATED TO RELATIVE SIZE OF MODEL ± 20%. INTER-OBJECT DISTANCES DISTORTED.	.....	SCORE 4
LEVEL 5	RELATIVE SIZE OF OBJECTS ON MAP ACCURATELY RELATED TO RELATIVE SIZE OF MODEL ± 10%. INTER-OBJECT DISTANCES APPROACHING CORRECT PROPORTION.	.....	SCORE 5
LEVEL 6	ALL SIZES OF OBJECTS AND DISTANCES ON MAP ACCURATELY RELATED TO MODEL ± 10%.	.....	SCORE 6

PERSPECTIVE OF MAP

LEVEL 1	NO RECOGNISABLE PERSPECTIVE	.....	SCORE 1
LEVEL 2	PRIMARILY A FRONT VIEW, NOT A SYMBOL.	.....	SCORE 2
LEVEL 3	MIX OF FRONT AND/OR 45° AND/OR 90° OR A CONSISTENT 45° FROM SEVERAL VIEWPOINTS.	.....	SCORE 3
LEVEL 4	CONSISTENT 45° PERSPECTIVE FROM ONE VIEWPOINT OR A CONSISTENT 90° WITH ONLY MINOR INTRUSIONS 45°.	.....	SCORE 4
LEVEL 5	CONSISTENT 90° PERSPECTIVE WITH REASONABLE PROPORTION.	.....	SCORE 5
LEVEL 6	CONSISTENT 90° PERSPECTIVE WITH GOOD PROPORTION.	.....	SCORE 6

PROPORTION OF MAP

LEVEL 1	NO LOGICAL OR "REALISTIC" PROPORTION	.....	SCORE 1
LEVEL 2	RECOGNISABLE AND "REALISTIC" PROPORTION IN RELATIVE SIZE OF OBJECTS ON MAP WHICH IS, HOWEVER, NOT RELATED TO MODEL	.....	SCORE 2
LEVEL 3	RELATIVE SIZE OF ALL OBJECTS ON MAP ROUGHLY RELATED TO RELATIVE SIZE OF MODEL ± 30%	.....	SCORE 3
LEVEL 4	RELATIVE SIZE OF OBJECTS ON MAP REASONABLY RELATED TO RELATIVE SIZE OF MODEL ± 20%. INTER-OBJECT DISTANCES DISTORTED.	.....	SCORE 4
LEVEL 5	RELATIVE SIZE OF OBJECTS ON MAP ACCURATELY RELATED TO RELATIVE SIZE OF MODEL ± 10%. INTER-OBJECT DISTANCES APPROACHING CORRECT PROPORTION.	.....	SCORE 5
LEVEL 6	ALL SIZES OF OBJECTS AND DISTANCES ON MAP ACCURATELY RELATED TO MODEL ± 10%.	.....	SCORE 6

PERSPECTIVE OF MAP

LEVEL 1	NO RECOGNISABLE PERSPECTIVE	.....	SCORE 1
LEVEL 2	PRIMARILY A FRONT VIEW, NOT A SYMBOL.	.....	SCORE 2
LEVEL 3	MIX OF FRONT AND/OR 45° AND/OR 90° OR A CONSISTENT 45° FROM SEVERAL VIEWPOINTS.	.....	SCORE 3
LEVEL 4	CONSISTENT 45° PERSPECTIVE FROM ONE VIEWPOINT OR A CONSISTENT 90° WITH ONLY MINOR INTRUSIONS 45°.	.....	SCORE 4
LEVEL 5	CONSISTENT 90° PERSPECTIVE WITH REASONABLE PROPORTION.	.....	SCORE 5
LEVEL 6	CONSISTENT 90° PERSPECTIVE WITH GOOD PROPORTION.	.....	SCORE 6

PROPORTION OF MAP

LEVEL 1	NO LOGICAL OR "REALISTIC" PROPORTION	.....	SCORE 1
LEVEL 2	RECOGNISABLE AND "REALISTIC" PROPORTION IN RELATIVE SIZE OF OBJECTS ON MAP WHICH IS, HOWEVER, NOT RELATED TO MODEL	.....	SCORE 2
LEVEL 3	RELATIVE SIZE OF ALL OBJECTS ON MAP ROUGHLY RELATED TO RELATIVE SIZE OF MODEL ± 30%	.....	SCORE 3
LEVEL 4	RELATIVE SIZE OF OBJECTS ON MAP REASONABLY RELATED TO RELATIVE SIZE OF MODEL ± 20%. INTER-OBJECT DISTANCES DISTORTED.	.....	SCORE 4
LEVEL 5	RELATIVE SIZE OF OBJECTS ON MAP ACCURATELY RELATED TO RELATIVE SIZE OF MODEL ± 10%. INTER-OBJECT DISTANCES APPROACHING CORRECT PROPORTION.	.....	SCORE 5
LEVEL 6	ALL SIZES OF OBJECTS AND DISTANCES ON MAP ACCURATELY RELATED TO MODEL ± 10%.	.....	SCORE 6

PERSPECTIVE OF MAP

LEVEL 1	NO RECOGNISABLE PERSPECTIVE	.....	SCORE 1
LEVEL 2	PRIMARILY A FRONT VIEW, NOT A SYMBOL.	.....	SCORE 2
LEVEL 3	MIX OF FRONT AND/OR 45° AND/OR 90° OR A CONSISTENT 45° FROM SEVERAL VIEWPOINTS.	.....	SCORE 3
LEVEL 4	CONSISTENT 45° PERSPECTIVE FROM ONE VIEWPOINT OR A CONSISTENT 90° WITH ONLY MINOR INTRUSIONS 45°.	.....	SCORE 4
LEVEL 5	CONSISTENT 90° PERSPECTIVE WITH REASONABLE PROPORTION.	.....	SCORE 5
LEVEL 6	CONSISTENT 90° PERSPECTIVE WITH GOOD PROPORTION.	.....	SCORE 6

ABSTRACTION/SYMBOLISATION OF MAP

LEVEL 1	NO LOGICAL CORRESPONDENCE BETWEEN MAP REPRESENTATION AND MODEL.	SCORE 1
LEVEL 2	OBJECTS ARE REPRESENTED IN DETAIL, MUCH OF WHICH DOES NOT CORRESPOND TO THAT ON MODEL. (i.e. IDIOSYNCRATIC REPRESENTATION)	SCORE 2
LEVEL 3	OBJECTS ARE REPRESENTED IN "PHOTOGRAPH-LIKE" DETAIL MOST OF WHICH CORRESPONDS TO THAT ON MODEL.	SCORE 3
LEVEL 4	EVIDENCE OF LIMITED ABSTRACTION, e.g. SOME DETAIL IS OMITTED IN A CONSISTENT FASHION, PERHAPS THROUGH USE OF A REALISTIC 90° PERSPECTIVE.	SCORE 4
LEVEL 5	OBVIOUS EVIDENCE OF CONSISTENT ABSTRACTION AND SOME EFFORTS AT SYMBOLISATION, e.g. MUCH DETAIL IS OMITTED IN A CONSISTENT FASHION, PERHAPS THROUGH USE OF ICONS AND/OR LABELS.	SCORE 5
LEVEL 6	OBJECTS ARE REPRESENTED EXCLUSIVELY WITH ABSTRACT SYMBOLS IN CONJUNCTION WITH A KEY.	SCORE 6

PERCEPTION OF LAND/SEA CARTOGRAPHIC DESIGNS BY URBAN STUDENTS IN GRADES 4, 8 AND 12

by GEOFFREY JONES*

Abstract. Black and white land/sea map designs appear in most school geography textbooks. It is assumed that students, both primary and secondary, can read the cues that differentiate land from sea on maps and that they find the designs pleasing and hence conducive to learning. Based on Head's (1966) study, this study focused upon students in grades 4, 8 and 12 and attempted to determine the extent of ambiguity and pleasingness of selected common land/sea designs imposed. An ambiguity index, Thurstone scales, and a Kruskal-Wallis A.N.O.V.A. were used to analyze the data.

The main findings of this study were:

1) map designs should have clear and concise cues representing land and sea on them, preferably low in ambiguity and high in pleasingness,

2) boys and girls in all three grades chose almost the same designs for ambiguity and pleasingness,

3) horizontal lettering assists an area to be seen as land, and

4) a thickened border is effective in distinguishing land.

Geographers have understood the value of sensory communication for centuries. The map, 'the basic tool of the geographer', has been the principle means by which geographic knowledge has been recorded and displayed. Through the use of maps geographers have developed this communication device to disseminate the myriad forms of geographic knowledge (Dent, 1970). To do this successfully symbols have been identified and used to represent things that are present in the real world. (see Diagram 1 for a procedure for map production).

One of the more basic considerations has been how to differentiate between land and water. Head (1966) discerned that, after a review of a number of international geography and geographic education journals, there appeared to be six major identifiable ways of representing land and water. He found that,

> 'In sum, a simple shore line is by far the most common land-sea representation, and two other types - shading and stippling - add to it to make only three representations the most widely used in the journals surveyed.' (p. 5)

This journal review provided a relatively broad perspective of the current practices of differentiating land from sea within the academic community. Each variation showed a boundary between land and a major water body. However, while these designs are in widespread use, there still remains the question of upon what basis(es) these designs have been acceptable.

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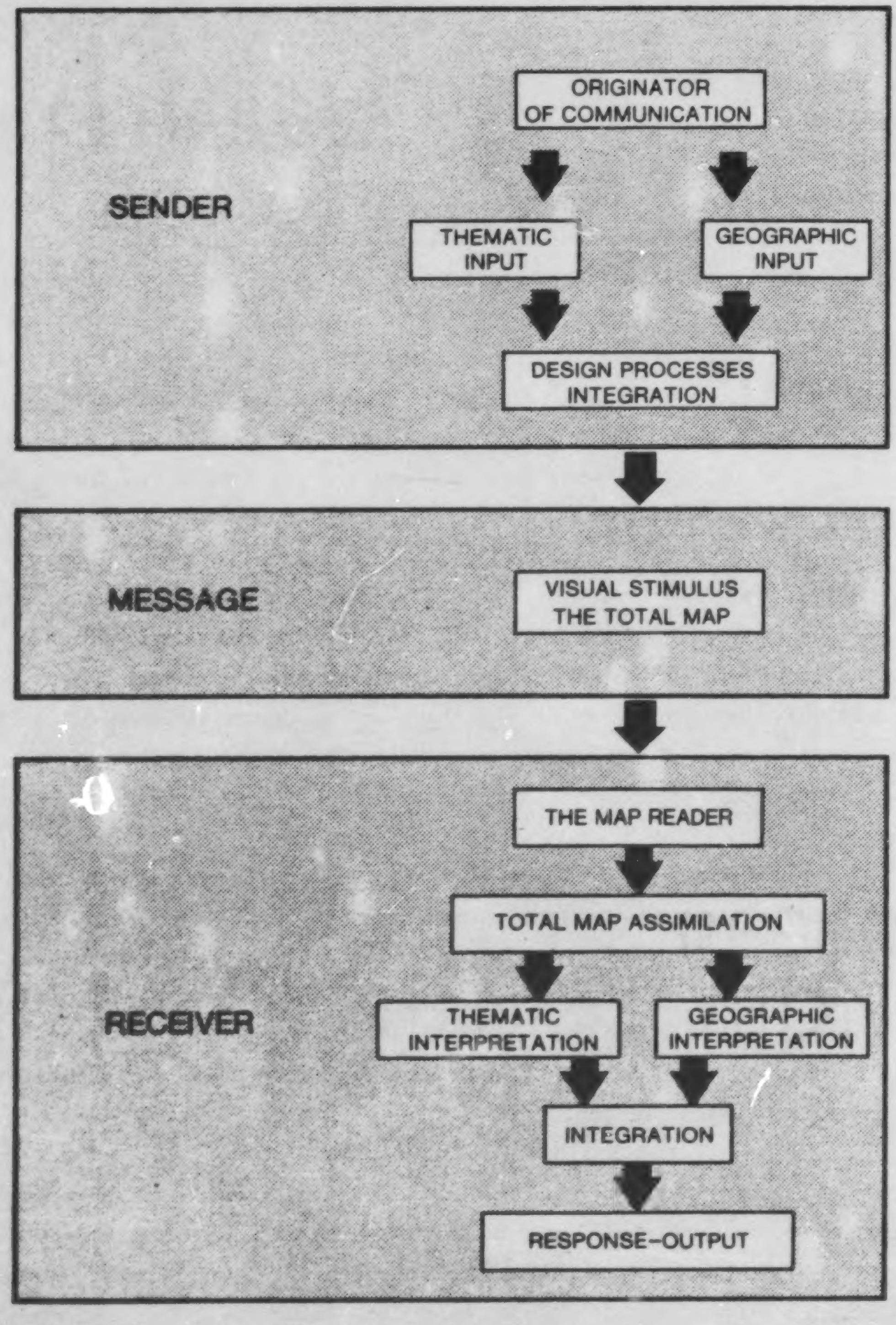
Diagram 1

A Procedure for the Map Maker and the Map User


SENDER
ORIGINATOR OF COMMUNICATION
THEMATIC INPUT
GEOGRAPHIC INPUT
DESIGN PROCESSES INTEGRATION
MESSAGE
VISUAL STIMULUS THE TOTAL MAP
RECEIVER
THE MAP READER
TOTAL MAP ASSIMILATION
THEMATIC INTERPRETATION
GEOGRAPHIC INTERPRETATION
INTEGRATION
RESPONSE-OUTPUT

PERCEPTUAL CONSIDERATIONS

Three bases for the perceptual ordering of stimuli seem important. They are:

a) visual space perception,
b) figure - ground perception,
and c) conditioning.

Each will be examined to illustrate its relationship to this project.

a) Visual Space Perception. An element of space, or depth, perception is probably involved in our reading of land/sea maps in as far as the shoreline contour highlights the land from the water. Water is basically flat, while land will frequently display topographic variation. By isolating cues in objects in three dimensional space we utilize both monocular and binocular methods. There are seven characteristics of monocular methods that require identification.

When two like forms are arranged one behind the other we experience a sensation of relative size. The smaller the object appears the further in the background that object will seem. As well, if the foreground object is interposed over the border of another object, when both objects are the same size, this interposition demarcates the latter object as being smaller. If objects have depth and we see surfaces tapering into the distance, we see a linear perspective, such as viewing light poles stretching down a street. Aerial perspective can be a powerful depth indicator where the modification of colour and clarity of perception of distant objects by the atmosphere operates. Associatively, the interplay of highlight and shade can help to define three-dimensional form, and re-enforces the perception of relative position through the interpretation of thrown shadows.

The further cues of movement parallax and accommodation, which refers to the viewers state of movement or non-movement in relation to background, and the eye's focusing ability to adjust automatically are both monocular. However, two eyes work together to produce convergence, the drawing together of lines of sight upon an object. This is the basis of stereoscopic vision. Ames (1925), Schlosberg (1941), and Ratoosh (1949) have discussed the importance of these cues on perception at length.

b) Figure - Ground Perception. Rubin (1960) investigated the phenomenon of figure and ground particularly through his psychological research involving the vase/profile diagram. From his studies and other related works, a number of associated and important principles have been deduced.

With the portion of the visual field that emerges as figure, at least seven attributes have been associated: 1) smallness of area relative to the other portion of the field; 2) surroundedness or partial surroundedness; 2) closure or arbitrary closure (a full-circle for instance, would be more likely to be seen as a figure than would a partially-closed circle or a "U"); 4) good continuation (portions of a figure should appear to "follow" naturally from the other portions); 5) articulation (profiles in the vase/profile diagram, for instance, are more likely to emerge as figures if eyelashes or ears are drawn in; in fact, any detail on one part of the field enormously increases its chances of being seen as figure); 6) assymetry; 7) brightness gradient (the area having the greatest gradient with the background will be seen as figure).

Further information concerns the attributes associated with increasing levels of awareness in viewing figure and ground stimuli. Subjects notice first the basic heterogeneity of field (i.e., that there is something other than a homogeneous view), then a difference in brightness between parts of this heterogeneous field. Awareness of contour between, and then shape of, the figure and ground comes next. An experience of the protrusion of the figure grows and becomes definite. In advanced stages the figure is seen to have surface texture, while the ground is filmy or translucent. Sometimes a halo may be obeserved surrounding a dark figure, a halo brighter than the peripheral portion of the ground against which it appears. In essence, attention, interest, and figure are closely allied:

> The focally clear portion of a visual experience is, in effect, that part of the field which stands forth in the experience, which obtrudes itself upon consciousness, which is distinct and prominent above the undifferentiated background, which can be pointed to, grasped, described, reported definitely upon, which persists in memory (Wever, 1928).

The description, it need harly be added, is of figure.

The importance of the foregoing facts in land-sea problems is considerable. The basic map relationships of land to sea may well be those of figure-ground. This is made clear in the following quotation:

> Occasionally we see a map which is meant to represent a country of well known form. On other maps we have often seen the shape of this country. And yet, as now before us, the map exhibits areas with entirely unknown shapes. Suddenly, however, a radical change occurs in our visual field: the unknown shapes disappear, and the well known shape of the country emerges. Good instances for this observation are certain charts of ship captains, on which the sea tends to assume the appearance which the land has on ordinary maps. Now, the contour of the land is the same on a

> marine chart as it is on a map of the usual type ... None the less, when looking at such a map, say, of the Mediterranean, we may fail completely to see Italy. Instead we may see a strange figure, corresponding to the area of the Adriatic --- which is new to us, but which happens to have shape under the circumstances (Köhler, 1947).

The difficulties of distinguishing sea from land are minimized if one of the two is seen as a recognizable shape. For most subjects this would mean that a continent, or some other well-known portion of territory, be clearly shown. The recognizable shape would appear as figure, since attention would be directed towards it. This figure would in most (but not all) cases be land.

In map design, then, the area to which attention is directed - usually, but not always, the land - should have applied to it the attributes of a figure. However, we are limited in the size and outline relationships by the features that we wish to portray; the attributes of smallness of area, surroundedness, closure, continuation, and assymetry are of only limited usefulness.

Two other figure-attributes, however, are important both in the physical stimulus and in the psychological perception of figure, and offer application to land-sea map problems. Articulation of figure, generally reacted to as "texture", and brightness gradient, an early-noticed difference in the field, can be applied in a variety of ways. Lettering lends articulation, and its application to an area should help that area to be seen as figure. Any markings, in fact, should enhance "figureness". As well, since backgrounds for maps are usually the margins, and these are generally white, the darker portion of a heterogeneous map field should be most likely to dominate as figure. Thus, in application of tones, consideration of figure-ground principles would suggest that the darker tone be used for the area, usually land, that is to be seen as figure.

c) Conditioning. Subsumed under the title "conditioning", we will here consider both "set", and "experience" or learning.

Experimental psychology has firmly established that stimulation does not fall on a passive receiver. On the contrary, as Dember (1960) has recognized,

> the individual is "prepared", implicitly or explicitly, for certain kinds of input; the input is actively dealt with on the basis of this preparation. The fate of the input is at least partly dependent on the nature of the preparation (p.299).

Explicit preparation would most likely occur in laboratory situations, and may consist of instructions on what is to be seen or heard, and the type of identification that is to be made in a succeeding experiment. The range of possible stimuli is thus narrowed, and the probability of a certain stimulus occurring is, for the subject, vastly increased. Implicit preparation operates in a similar manner. Thus, one more easily recognizes - both visually and auditorially - familiar or frequently-used words, since the probability of their occurrence is high (Dember, 1960, p.273).

If figure-ground perception is involved in the identification of land-sea representations, then a group of set-inducing experiments with figure-ground stimuli have particular relevance here. Boring's ambiguous young woman/old woman figures was tested and found to be seen by 65% of the viewers as the young woman, and by 35% as the old woman (Leeper, 1935). Four groups of subjects were then a) given verbal descriptions of the young woman figure, b) given verbal descriptions of the old woman figure, c) shown non-ambiguous drawings similar to the young woman figure, and d) shown non-ambiguous drawings similar to the old woman figure. The verbal preparation was found to have little effect upon the subjects' sensory organization of the image; but the perceptual preparation controlled almost entirely the subsequent organization of the ambiguous figure (Leeper, 1935).

A further experiment has studied the influence of set-like influences on the first impressions of persons (Kelley, 1950). Groups of subjects were given an exaggerated and incorrect verbal description of a person they were about to meet - basically, a description of the person's personality as warm or cold. The subjects were then introduced to the person for a period of time (he conducted a class as a fill-in instructor with a group of students) and were asked afterwards for their opinions. The subjects were found to have been considerably influenced by the conditioning.

In a practical map reading situation, any or all of the above outlined types of conditioning may occur, most probably implicitly and even subconsiously. The preparation of the individual reader may or may not include considerable exposure to land-sea maps. If not, the reading of a land-sea map in the context of a text book, for instance, would likely be conditioned both by the subject matter of the book and by earlier less ambiguous maps in the book. Even if a subject views a single land-sea map, with no earlier similar experience, if a landward (or seaward) set was developed the subject may well attach "landness" (or "seaness") to the area that emerges as figure.

THE STUDY

This study evolved as a continuation of a previous piece of research by Head

(1966). Bearing in mind the previously discussed considerations, he developed twelve promising map designs which portrayed varying land/sea differences, and further, he selected seven of these to determine pleasingness. He then applied each instrument to a group (N = 34) of undergraduate students located in a university in the United States. Using an ambiguity index and Thurstone scales he obtained the following results. (See Appendix 1 for the map designs used.)

For many of the traditional map representations of land and sea, subjects showed little agreement on the area of land and the area of sea. Representations D and E both widely used, were highly ambiguous. The use of lettering, however made a considerable difference, for representation D, with lettering added (representations K and J) moved to a group of only moderate confusion, the lettered area being chosen as land. Representation F, registered low ambiguity but choice of land and sea was directly opposite to the representation's most frequent manner of use. In its traditional use, with sea stippling, the addition of lettering to the land led to a more divided opinion. Representation C was a little confusing, but has fallen from general cartographic use. Similarly, representation A, though causing little confusion, was generally held to be unacceptable today. Representation M, however, designed on psychological principles, offered almost as great a subjective agreement as representation A.

Rough comparisons of test data with the perceptual principles involved in each of the representations suggested that a re-enforcing combination of any two principles was usually necessary to produce low ambiguity. Figure-ground principles in isolation seemed to be particularly ineffective.

Unlike many tests of attitude, in which the consensus of opinion can often be judged closely before the administration of a psychological test, the aesthetic values of land-sea representations were highly difficult to prejudge.

The most pleasing representations were C, E, and F. E and F were two of the three most used land-sea representations; C has been thought 'old-fashioned", but if pleasingness was any indication of fashion, it was not apparently so judged by those tested. B and H were also considered archaic, but were moderatly liked by the subjects. Representation M, constructed on psychological principles for little confusion, and standing high in promise by the results of the ambiguity test, was unfortunately, little liked.

Most surprising was that representation D, the simple shore line, used in more than 50% of the journal maps surveyed, polled the lowest score of pleasingness. Since the same subjects were used for this test as for the ambiguity test some dislike may have stemmed from their difficulty in identifying sea and land.

Or, and perhaps not exclusively, subjects may dislike such simple design. Representation C, waterlining, scored high on the first two counts, but has fallen from favor with cartographers. Representation E, though highly acceptable to cartographers and highly pleasing, was confusing. Representation F, although acceptable to cartographers, highly pleasing, and little confusing to readers was interpreted by readers opposite to its use by cartographers. Representation M, though offering almost no confusion between land and sea was, as it stood, unacceptable aesthetically. Modification of representation M - to reduce its strikingness - offers some promise. The combination of lettering and various patterned representations appeared particularly productive, however, further tests of combinations are needed.

From these results it appeared that the variety of land/sea designs met with varying levels of discriminability and pleasingness by university level students. However, these students are but a small sub-set of a much larger group of students who regularly are required to use textbook materials, maps and atlases as part of their regular instruction.

Primary and secondary students in schools throughout Australia (and indeed throughout much of the world) are exposed to geography texts and maps, or other such materials, as they seek to master geographic knowledge. What thought is given to how maps (especially ones showing land and water) are presented in these materials? Do primary and secondary grade students perceive land/sea designs in the same way as university students? Do the selected designs hold the same appeal to school students? Such questions have not been answered to this time and provide the focus for this study.

Statement of the Problem

The main objectives of this study were to determine whether younger students can distinguish between land and sea on selected map designs, and whether selected alternative designs of land and sea are as pleasing as more commonly accepted designs. Specifically this study attempted to provide answers to the following questions.

1) Are there differences between the abilities of students in Grades 4, 8 and 12 to distinguish between land and sea?
2) Are there differences between students in Grades 4, 8 and 12 in their abilities to register aesthetic appeal using selected land/sea designs?
3) Are there differences between the abilities of boys and girls in Grades 4, 8 and 12 to distinguish between land and sea?
4) Are there differences between boys and girls in Grades 4, 8 and 12 in their abilities to register aesthetic appeal using selected land/sea designs?

PROCEDURES

Sample. Students in Grades 4, 8 and 12 were used in this study. The respective N's were 49, 52, and 40 (see Table 1). The students were located in an inner city Primary and Secondary school in a large urbanized area (Brisbane). Students were conveyed to the schools from various areas around the city, however, a significant proportion of the students used in the study came from the local area around the school. Given this distribution it appeared reasonable to infer that the sample tapped a reasonable cross-section of subjects if such criteria as socio-economic status, I.Q., and academic performance had been used.

Table 1

Distribution of Subjects by Grade and Sex

GRADE

	Sex	N	Grand Total
4	M	37	49
	F	12	
8	M	26	52
	F	26	
12	M	15	40
	F	25	

Instrumentation. All students used in the study were exposed to the same instruments (see Appendix 1 for a copy of the instruments). According to the study objectives the instruments were arranged to determine (i) ambiguity and (ii) aesthetic appeal of selected, but common black and white, land/sea designs (see Head, p.17-22).

(i) Ambiguity. Twelve common ways of representing land and sea on black and white maps were chosen after an exhaustive search of four major international geography journals (see Head, C.G., Land-Sea Representations in black and white Cartography, 1966, p.5 for a complete discussion of the sources of the map designs, the map designs themselves, and the practical and psychological considerations that went into their selection). Students in this study were asked to carefully look at each map with the idea of deciding which portion of the map was sea and which was land. While the line partitioning each square was not the same shape, in general, the line was oriented from the top to the bottom of each square. Students were given a response sheet upon which they indicate land or sea (using L or S) in the boxes provided (see Appendix 2).

(ii) Aesthetic Appeal. As a further measure students were asked to indicate whether there were selected designs presented that "appealed" to them more than others. Seven maps were selected (see Head, C.G., op. cit. for a discussion of the reasons behind their selection), and each was paired with every other map. This provided twenty-one pairs of maps. On the response sheet provided students were then asked to mark in the appropriate box which of the two maps held more appeal for them (see Appendix 2).

Altogether, students were allowed one class period of thirty-five minutes to complete the tasks. During this time the researcher gave all instructions, monitored student questions and response sheets.

Statistical Procedures. The measure of land/sea differentiation was obtained by computing an index of ambiguity. These were then arranged in numerical order along a finite continuum (0 - 100%) for each grade. A Thurstone Indirect scale method was used to determine aesthetic appeal for each grade.

A Kruskal-Wallis, one-way analysis of variance was used in conjunction with the data of the land/sea perceptions for boys and girls.

Limitations.

1. It was assumed that, while the researcher gave all instructions, and while students could ask questions, all students understood clearly all instructions and responded accordingly, especially the younger students.
2. While the students came from a variety of backgrounds they were representative of an urban population and hence their responses were generalizable.

RESULTS

The following outcomes were obtained for each grade and between boys and girls in each grade as a result of the statistical procedures.

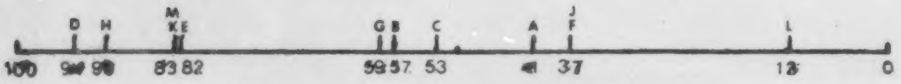
Grade 4

The instrument containing twelve land/sea map designs was administered to Grade 4 students. On the test of ambiguity the forty-nine students produced the following results as summarized in Table 2.

Table 2

Percent Ambiguity of Grade 4 Students

(Representations are identified by letter)



The Grade 4 students were then asked to indicate which map from a pair of maps they found more pleasing. Twenty-one pairs of maps were presented. The results have been ranked using scores that are ranked from most postive to most negative. Table 3 presents the rankings.

Table 3

Aesthetic Appeal of Paired Maps for Grade 4 Students

(Representations are identified by letter)

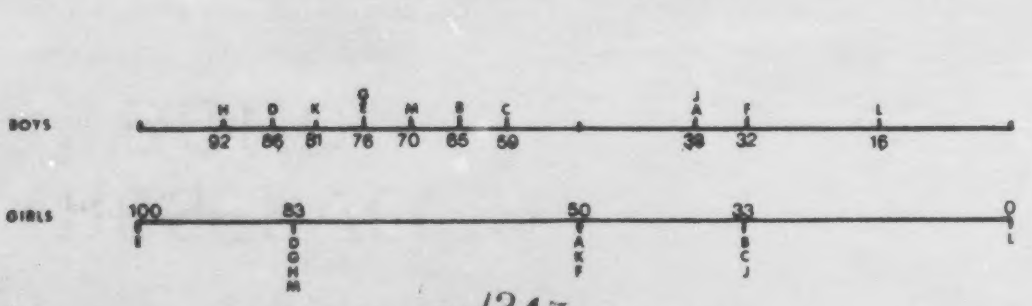
Rank	Score	Map Letter
1	0.1917	E
2	0.1054	M
3	0.0693	H
4	-0.0371	F
5	-0.0601	D
6	-0.1306	B
7	-0.1386	C

On the test of ambiguity boys (N = 37) and girls (N = 12) in Grade 4 produced the following results as summarized in Table 4.

Table 4

Percent Ambiguity of Boys and Girls in Grade 4

(Representations are identified by letter)



A Kruskal-Wallis A.N.O.V.A. was used to determine whether there was a statistically significant difference between boys and girls in Grade 4 on the measure of pleasingness. Table 5 summarizes the outcome of the analysis.

Table 5

Aesthetic Appeal of Paired Maps for Boys and Girls in Grade 4

	N	Mean Ranks	Significance
Boys	37	24.66	0.639
Girls	12	26.04	

This outcome was not statistically significant. Consequently it would appear that boys and girls in Grade 4 found the same degree of pleasingness in the respective maps.

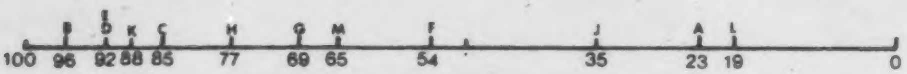
Grade 8

The instrument containing twelve land/sea map designs was administered to Grade 8 students. On the test of ambiguity the fifty-two students produced the following results as summarized in Table 6.

Table 6

Percent Ambiguity of Grade 8 Students

(Representations are indentified by letter)



The Grade 8 students were then asked to indicated which map from a pair of maps they found more pleasing. Twenty-one pairs of maps were presented. The results have been ranked using scores that are ranked from most positive to most negative. Table 7 presents the rankings.

Table 7

Aesthetic Appeal of Paired Maps for Grade 8 Students

(Representations are identified by letter)

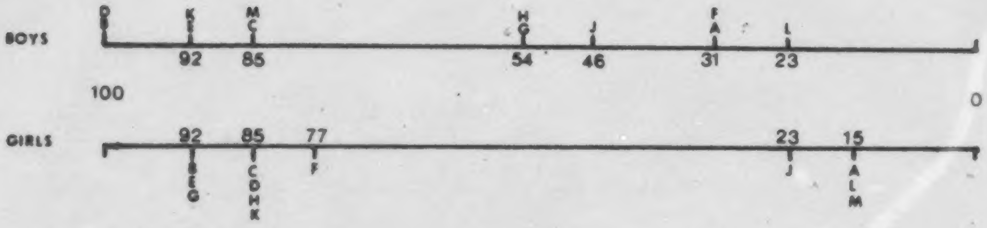
Rank	Score	Map Letter
1	0.4966	B
2	0.4911	E
3	0.2538	H
4	0.1806	M
5	-0.1980	C
6	-0.2823	F
7	-0.9418	D

On the test of ambiguity boys (N = 26) and girls (N = 26) in Grade 8 produced the following results as summarized in Table 8.

Table 8

Percent Ambiguity of Boys and Girls in Grade 8

(Representations are identified by letter)



A Kruskal-Wallis A.N.O.V.A. was used to determine whether there was a statistically significant difference between boys and girls in Grade 8 on the measure of pleasingness. Table 9 summarises the outcome of the analysis.

Table 9

Aesthetic Appeal of Paired Maps for Boys and Girls in Grade 8

	N	Mean Ranks	Significance
Boys	26	24.85	0.429
Girls	26	28.15	

This outcome was not statistically significant. Consequently it would appear that boys and girls in Grade 8 found the same degree of pleasingness in the respective maps.

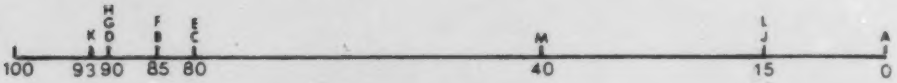
Grade 12

The instrument containing twelve land/sea map designs was administered to Grade 12 students. On the test of ambiguity the forty students produced the following results as summarized in Table 10.

Table 10

Percent Ambiguity of Grade 12 Students

(Representations are identified by letter)



The Grade 12 students were then asked to indicate which map from a pair of maps they found more pleasing. Twenty-one pairs of maps were presented. The results have been ranked using scores that are ranked from most positive to most negative. Table 11 presents the rankings.

Table 11

Aesthetic Appeal of Paired Maps for Grade 12 Students

(Representations are identified by letter)

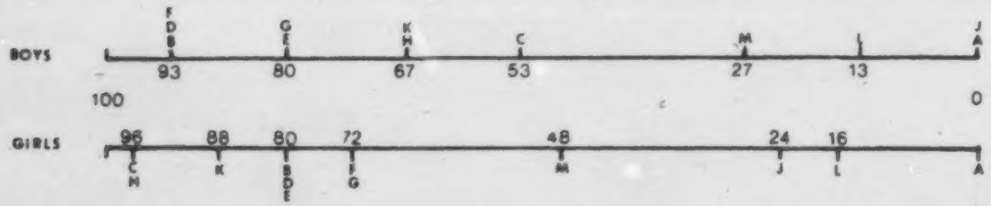
Rank	Score	Map Letter
1	0.5740	B
2	0.5710	E
3	0.4743	H
4	0.0979	F
5	-0.2015	M
6	-0.5396	C
7	-0.9760	D

On the test of ambiguity boys (N = 15) and girls (N = 25) in Grade 12 produced the following results as summarized in Table 12.

Table 12

Percent Ambiguity of Boys and Girls in Grade 12

(Representations are identified by letter)



A Kruskal-Wallis A.N.O.V.A. was used to determine whether there was a statistically significant difference between boys and girls in Grade 12 on the measure of pleasingness. Table 13 summarizes the outcomes of the analysis.

Table 13

Aesthetic Appeal of Paired Maps for Boys and Girls in Grade 12

	N	Mean Ranks	Significance
Boys	15	22.17	0.481
Girls	25	19.50	

This outcome was not statistically significant. Consequently it would appear that boys and girls in Grade 12 found the same degree of pleasingness in the respective maps.

DISCUSSION OF THE RESULTS

The major focus of this study was upon four research questions. These questions will be used to organize the discussion of the results.

1) Are there differences between the abilities of students in Grades 4, 8 and 12 to distinguish between land and sea?

This question was concerned with the ability of the twelve map designs to discriminate between land and water. Students in Grades 4, 8 and 12 clearly saw the map designs A, J and L as distinguishing land and sea. Map L uses a simple, but rather heavy coastline, with the heavy line continued around the margin of the map on one side of the sheet so as to enclose the figure. This outcome would suggest that the enclosed area drew the students' attention to the enclosed, or land, area and identified it as such. Map J employed lettering on one side of the design and this gave the students the necessary cue which map D lacked, for instance. Map A used an example, although archaic, of a meaningful symbol to make clear the differentiation between land and sea. As students in all grades were able to select land and sea most positively this would suggest that the use of such symbolization could still be useful. Further, the unambiguous use of the symbol side of the map re-enforced this researcher's view that the results of the test by all three grade levels could not be considered suspect, an important consideration when operating in the affective domain of human responses.

Map M produced a decreasing degree of ambiguity across the class groups. This map was designed upon the psychological principle of texture (figureness) with the ground less clear or translucent. As well this map applied the visual depth perception cue of aerial perspective. From these results it would seem that considerations such as those for this map are more relevant to older students, perhaps students who have already entered Piaget's fourth stage, that of abstract thinking. If the students conditioning tends to have them equate land with figure, then the textured area should emerge as land. This was a strong suggestion with the responses of older students.

At the other end of the scale two maps strongly indicated high ambiguity for the students in all three grade levels. Maps D and H appeared to confuse students when they had to attempt to identify land and sea. Map D, the poorest discriminator in all three grades, is understandable as it represented a simple shoreline only, with no cues to assist the students in identifying land and sea. Map H utilized horizontal lining as the sea area and is based upon the principle of brightness gradient and interposition. Students in all three grade levels appeared to be confused as to whether the plain or lined area stood out as figure. Map E also created confusion in all three grades. This map utilized a forty percent screen pattern, usually representing the sea area. Like Map H it is suspected that students encountered dissonance when they had to determine land and sea. They were not sure whether one area stood out more than the other given the cues offered. It would appear that this type of land/sea differentiation is little used in textbook or other instructional materials and might account for the trouble students encountered.

2) Are there differences between students in Grades 4, 8 and 12 in their abilities to register aesthetic appeal using selected land/sea designs?

With one notable exception, students in Grades 8 and 12 found maps B, E and H the most pleasing, while students in Grade 4 found maps E, M, and H most pleasing. Map E employed a 40% screen for the sea, while map H used horizontal lining for the sea. The brightness of the ground appeared to highlight the figure, accentuating the clean, clear lines of the shoreline. It is suspected that this accentuation is eye catching and hence appealing. Students in Grades 8 and 12 ranked map B the highest. This representation known as a 'silk-shot effect' is not frequently used in map construction today. It relies upon the principle of interposition where the left-hand side should appear lower, and thus, as sea. The uneven ending of the lines and their density suggests a shadow of the land on the sea as well. The combination of these factors seemed to appeal more to the eye of the older students. However, this was not the case with the Grade 4 students. They ranked this map very low in aesthetic appeal possibly due to the confusion it may have created through the apparent disjointedness along the coastline.

As expected, the control map, map D, was ranked very low by all three groups. This map presented a simple shoreline drawn through the enclosed area. In this state it offers very little appeal even though it is probably the most common form of illustrating the change from land to sea. Map C was also found to be most unappealing. Waterlining, as the representation is generally known by, was a conventional method based upon the stylization of waves breaking upon the shore. However, students apparently did not appreciate this design and thus ranked it low in aesthetic appeal, particularly those students in Grade 4. These students possibly associated the same degree of disjointedness in map C as apparently was present in map B.

3) Are there differences between the abilities of boys and girls in Grades 4, 8 and 12 to distinguish between land and sea?

Boys and girls in Grade 4 appeared to select the same maps as showing a low degree of ambiguity. Maps L and J were selected as differentiating land and sea clearly. Similarly, at the other end of the scale maps D and H clearly produced confusion in both groups. Based upon this outcome, it would seem that primary students used in this study, be they boys or girls, would prefer to encounter maps that contain visual cues that clearly differentiate land from water and which minimize visual 'noise'. It was also interesting to note that the map designs evoked a range of responses on the continuum for boys, while girls responses tended to cluster at discreet points on the continuum. At this stage it is difficult to determine what this might mean, but suffice it to say the trend did continue in Grade 8 but seemed to disappear in Grade 12.

A similar result was obtained for boys and girls in Grade 8. Maps A and L both produced low levels of ambiguity suggesting that the simpler more obvious designs are more appropriate with students in the lower years of their schooling. Of interest, however, is that girls selected map M as showing low ambiguity while boys indicated that it was quite confusing. A possible reason for this difference may be found in the psychological principles used in the design. Grade 8 girls may be able to cope with the psychology of the figure (texture) and the 'translucent' background better than boys at this age possibly due to their more advanced stage of mental and abstract thinking development. Map F also produced a disparate discriminability index. Boys indicated that this map discriminated land and sea clearly, while girls appeared to be quite confused. No possible reason is forthcoming at this time.

Boys and girls in Grade 12 were united in the selection of maps with low ambiguity. Maps A, J, and L were the major selections by both groups. These maps were probably chosen for their simple, clear presentation of visual cues, which follows closely the choices made by students in the lower grades. However, there was not the clear relationship of designs with high ambiguity, that appeared with the younger students. Perhaps maps D, B, and E are the closest with high ambiguity indices, however, the more even spread of indices along the continuum possibly indicates that both boys and girls see the designs a little differently.

A major finding of this study, which would seem to hold ramifications for geographic educators, geography teachers, and map makers, is that, at least for the students used in this study, maps must have clear cues placed on them if our students are going to be involved in meaningful map work.

4) Are there differences between boys and girls in Grades 4, 8 and 12 in their abilities to register aesthetic appeal using selected land/sea designs?

A Kruskal-Wallis A.N.O.V.A. was used to test whether differences exist between boys and girls in Grades 4, 8, and 12 on a measure of aesthetic appeal. In all comparisons there was no siginficant difference. This strongly suggests that where the paired map designs were used to determine pleasingness the same maps provided a similar degree of appeal to both boys and girls in their respective grade levels.

CONCLUSIONS

A wide variety of methods have been used to distinguish land from sea. The styles of the times, but more importantly map production technology, have influenced which methods are used currently. These methods are applied quite widely to academic journals, but of more significance to this study, they also appear in textbook and other written material in our geography classrooms. When we select materials we probably give very little thought to the design of maps and their effectiveness in providing information to our students.

Why should you? The publishers know what they are doing in presenting a map, the writer has presented all the relevant information to the area under study. All you have to do is prepare your instruction, and maybe even pay a little attention to the maps that are included. However, keep in mind, if your students are confused by a particular design or if they find a design unpleasing, their ability to and interest in learning is already diminishing rapidly. What have we learned then?

The most significant outcomes of this study included,

1) map designs should have clear and concise cues representing land and sea on them, preferably low in ambiguity and high in pleasingness,

2) boys and girls in all three grade levels were fairly similar in their choices of map designs that minimized ambiguity and maximized pleasingness. They were also similar in their choices of map designs that had high ambiguity. Some of the more psychologically-oriented designs suggested by Head (1966) were not well received by these school students,

3) the use of horizontal lettering (Map J) helps an area to be seen as land, and

4) the use of a thickened border (Map L) around an area also aids its identification as land.

This study focussed upon responses from urban students in Grades 4, 8, and 12. A follow up study is now needed to look at,

1) a rural group in the same grades,

2) an indigenous group in the same grades,

3) and a replication of Head's study with university level students.

Cross tabulation of results may reveal practical and/or psychological factors that will cause us to look more closely at how maps use cues especially in differentiating land and sea and provide us with clear guidance as to those most effective for classroom experiences.

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APPENDIX 1

To the Student,

The study of coastlines can be quite fascinating to a geographer. However, while we look at an actual coastline, we have an immediate picture of its shape in particular. One of the tasks of a geographer is to re-present that picture as a map. This means that the geographer must produce a map that shows both land and water in such a way that other people can recognize each immediately. As a result a great many ways of showing land and water have been used. Some of the ways for showing land and water are shown on the maps that follow.

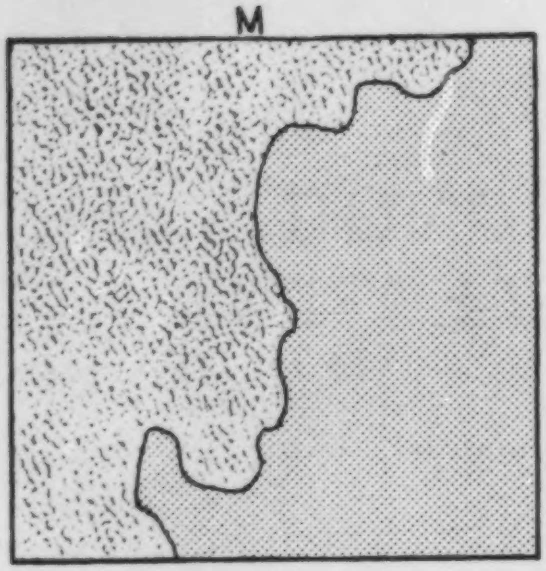
You have two tasks to complete. Neither will take very much of your time and they are not difficult but you must give your undivided attention to your tasks.

1. You have been supplied with an answer sheet. You will notice that two separate sets of answers are called for. Task one requires that you look at the maps on the first two pages. The maps are marked M, K, D, J, L, A, F, C, B, H, E and G. Look at each map separately for a moment, then ON YOUR ANSWER SHEET mark whether you think the left hand side is land or water. Use the letter of the alphabet L or W. If you marked W in the box on the left hand side then you must mark L in the box on the right hand side.

E.G. 1. W L

Please begin marking your answer sheets now. Stop when you have completed your choice of land and water on these twelve maps.

M



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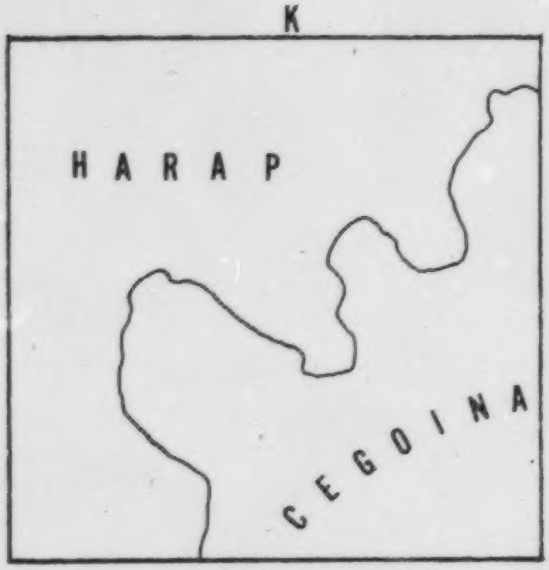
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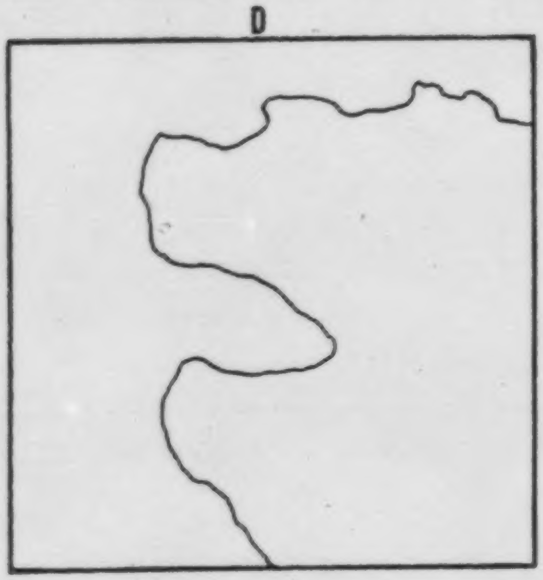

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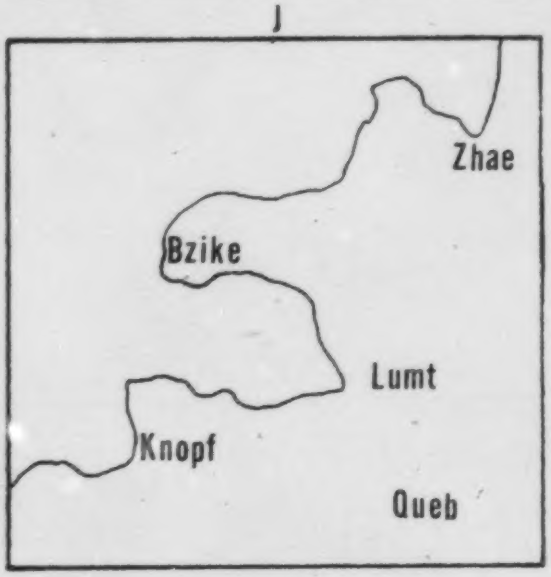
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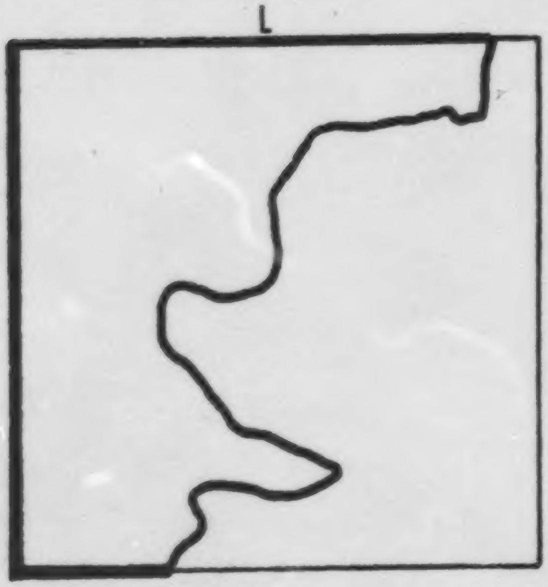

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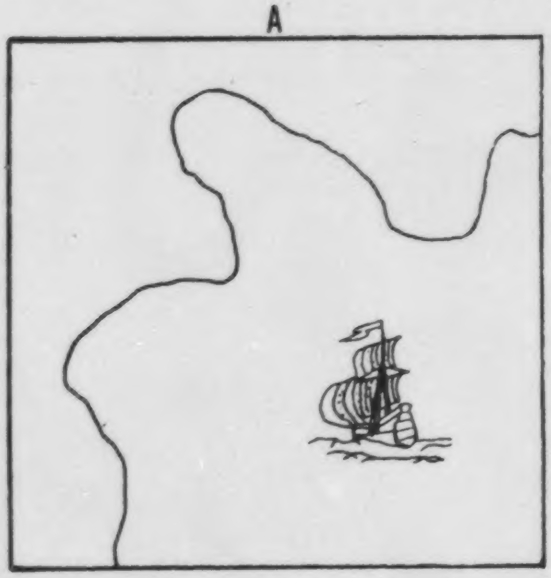

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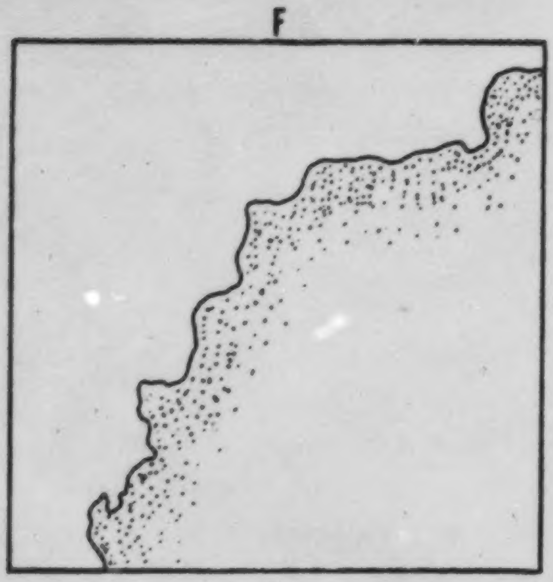

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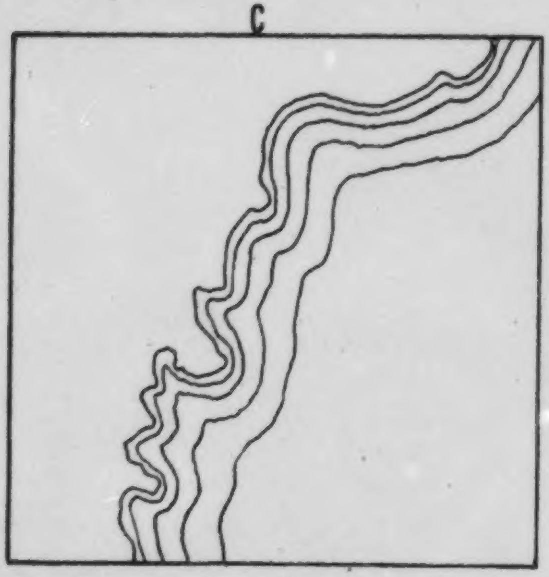

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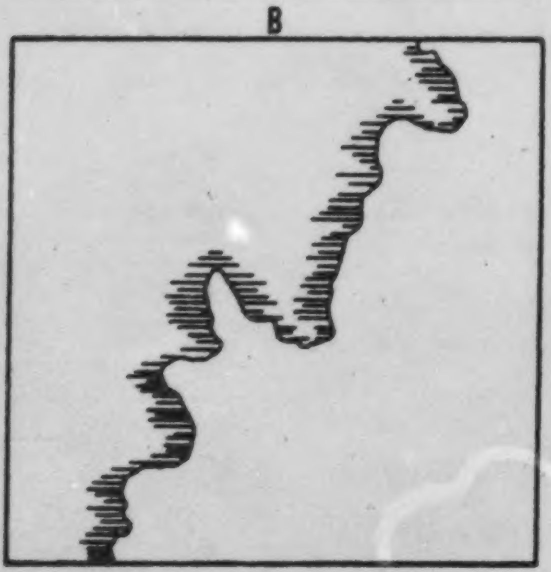

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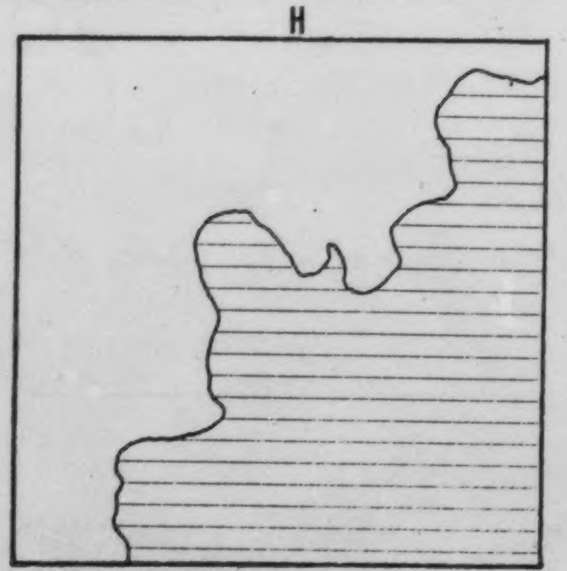

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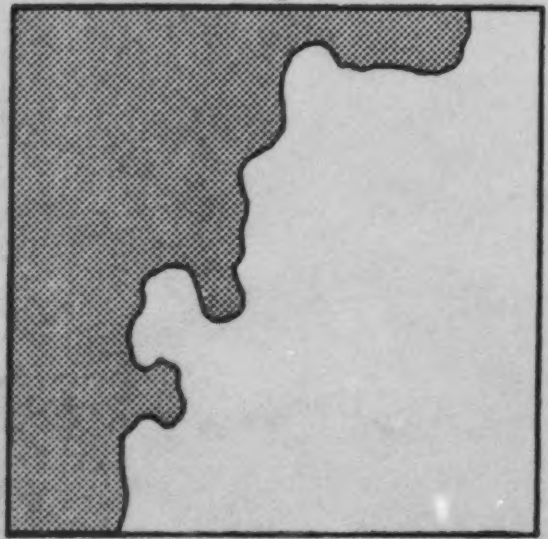

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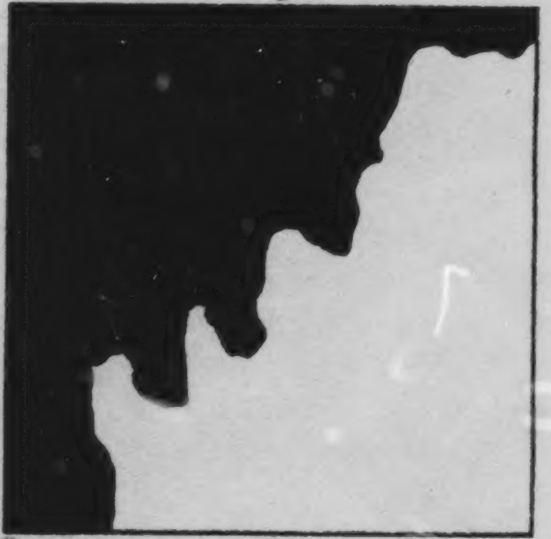
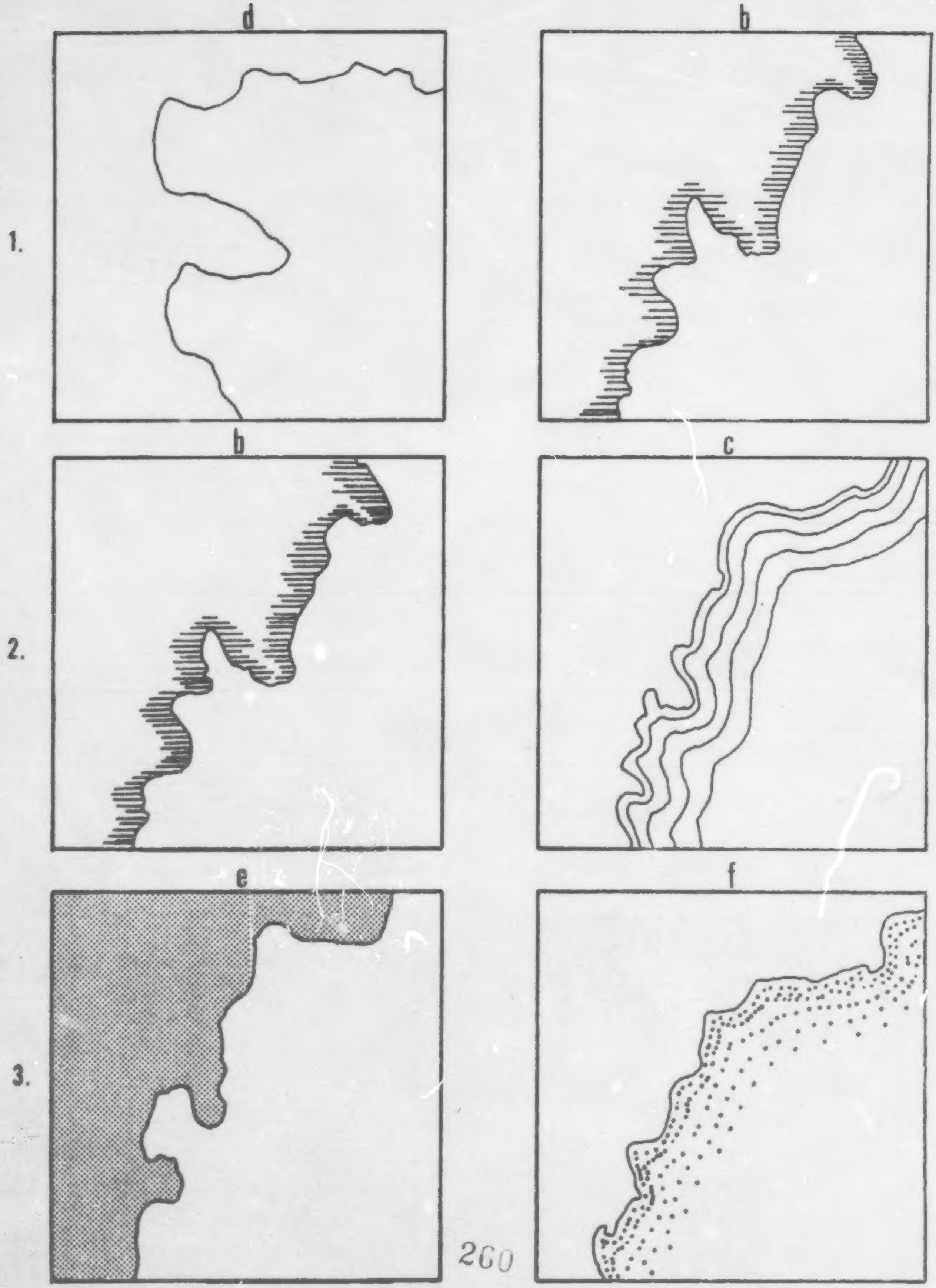


2. Some of the twelve maps have been selected and presented as pairs. For instance, Map D and Map B are paired first. I would ask that you look at each pair of maps carefully in this task, for you must choose which of the two maps appeals to you the best. As you look at each pair of maps choose which one appeals to you the most and then ON YOUR ANSWER SHEET place a cross X in the box with the alphabetical letter of the map that you like the most.

When you have finished place your answer sheet and the map file together and I shall collect them.

Thank you very much for your time and your co-operation.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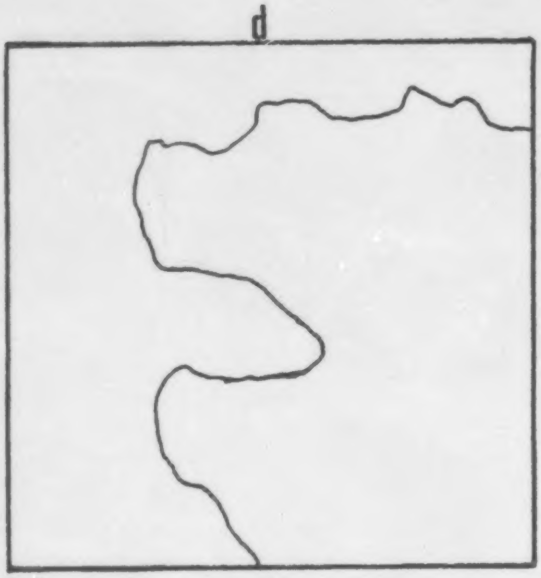

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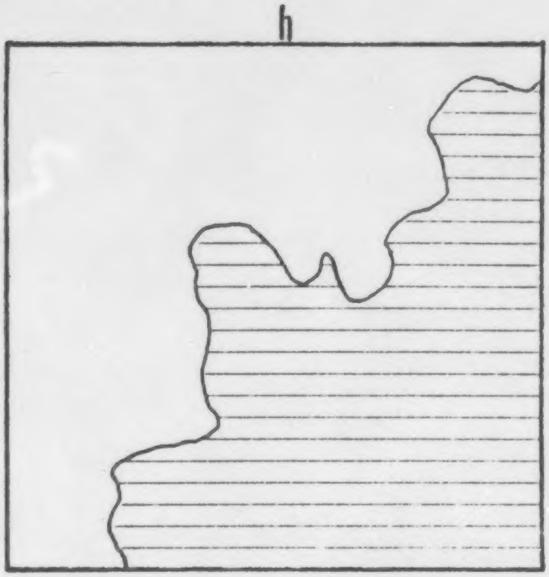

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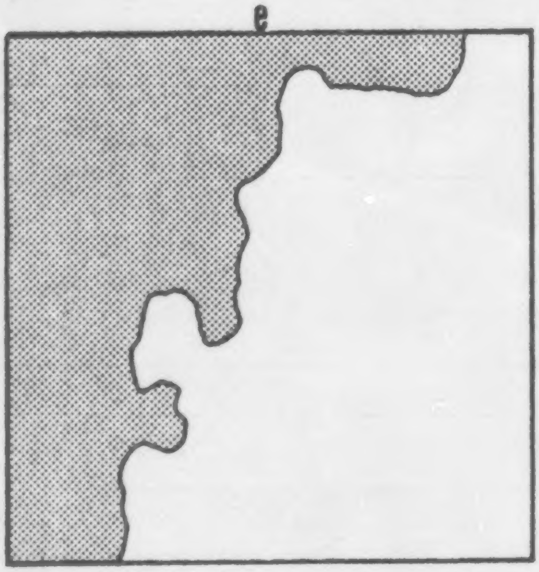

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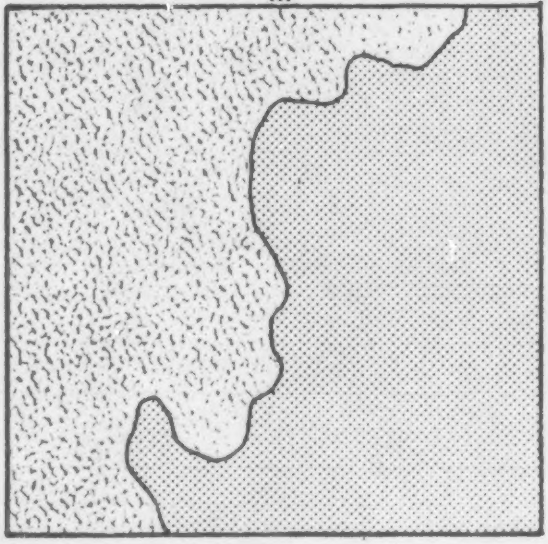

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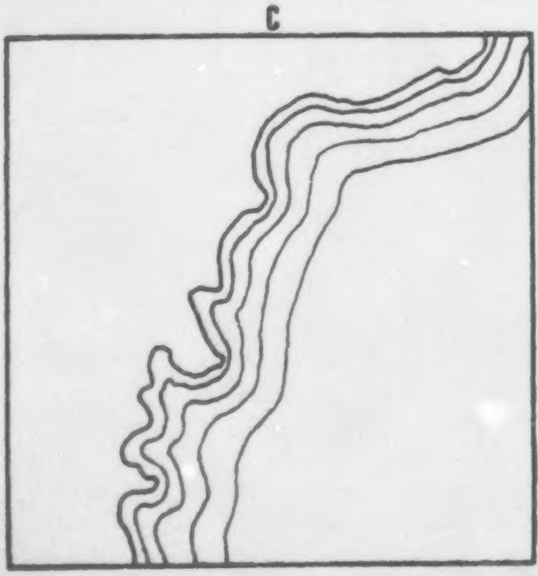

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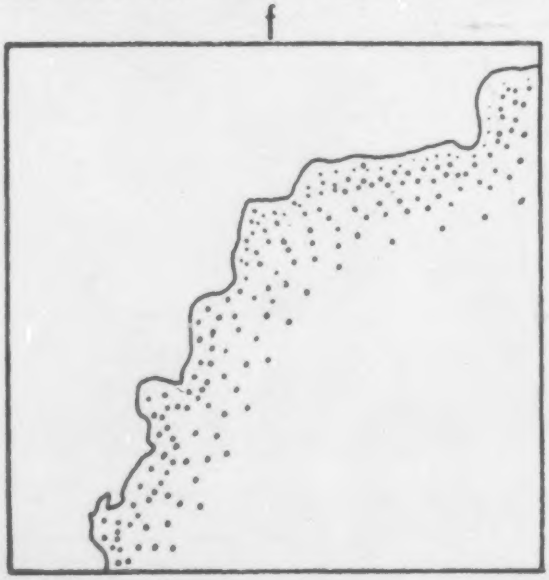

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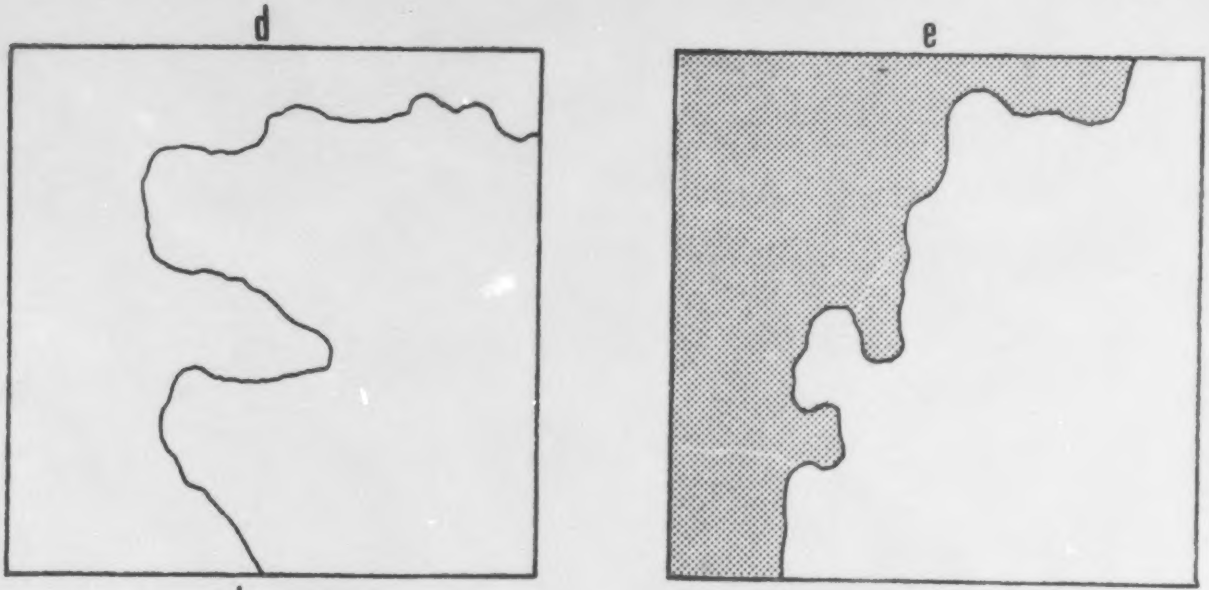

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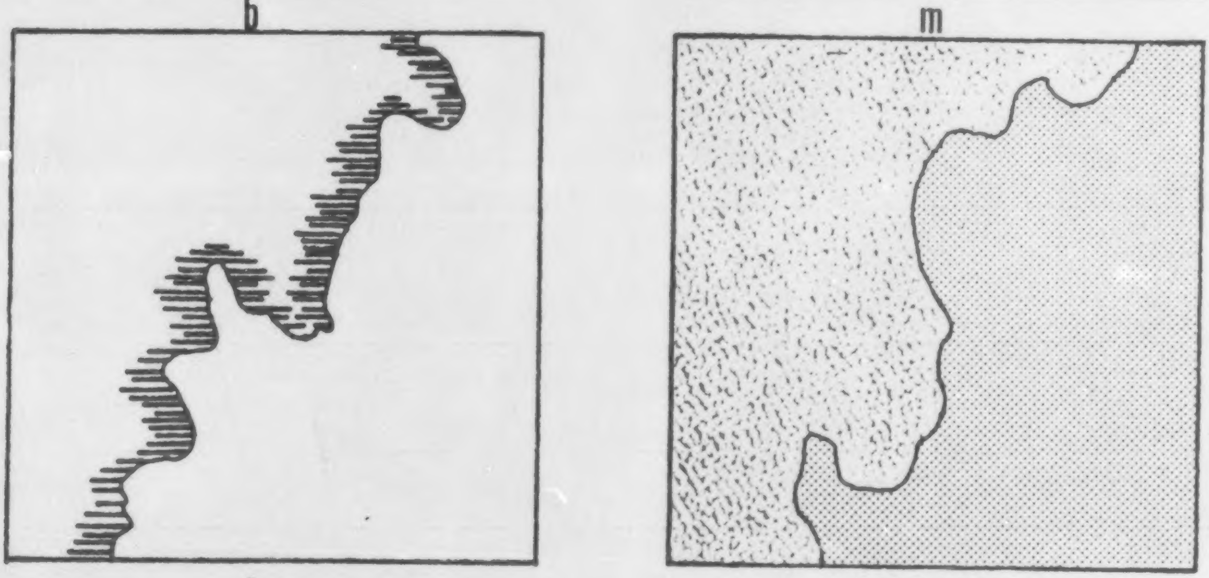

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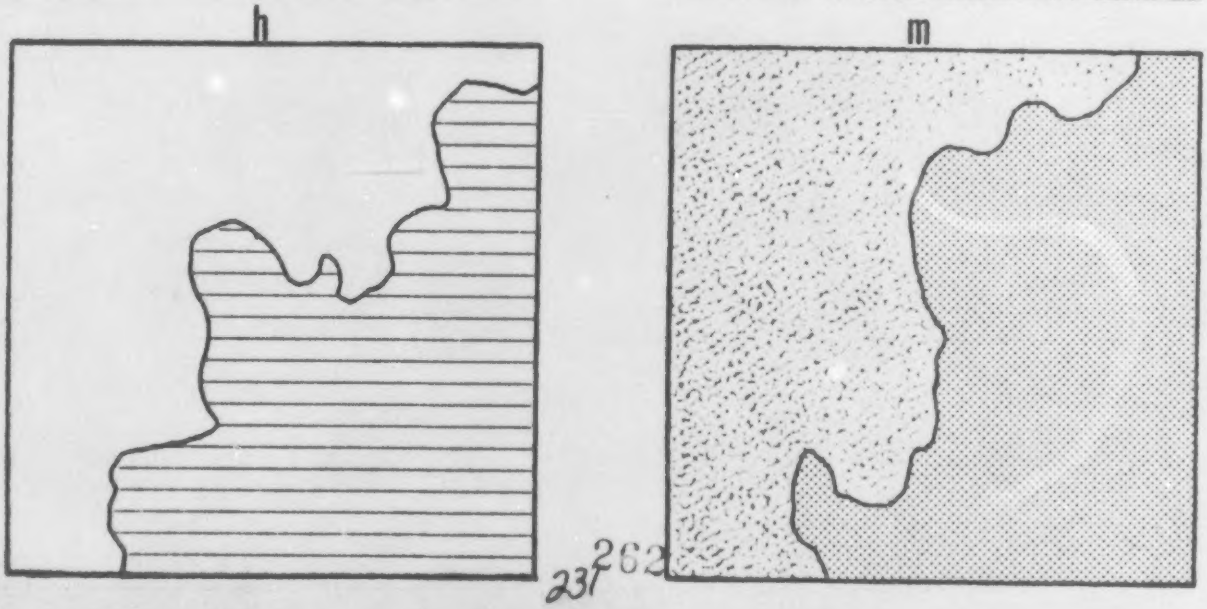

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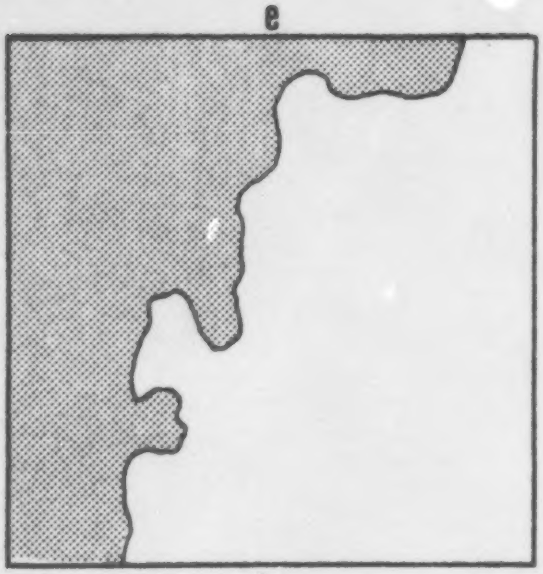

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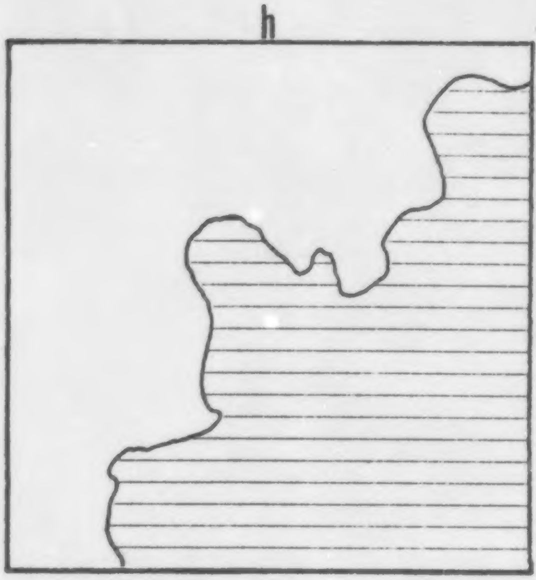

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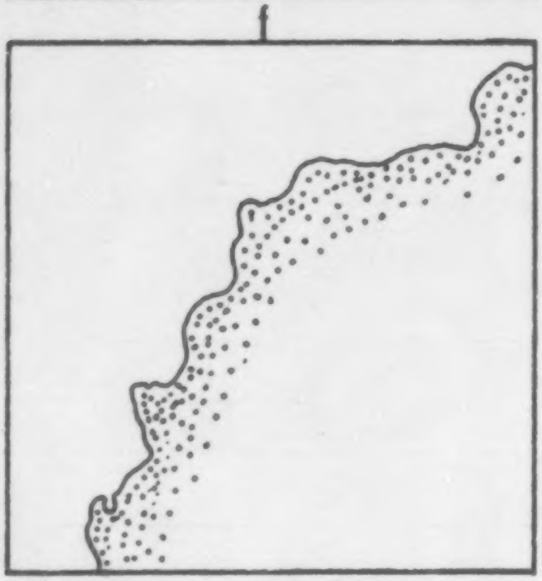

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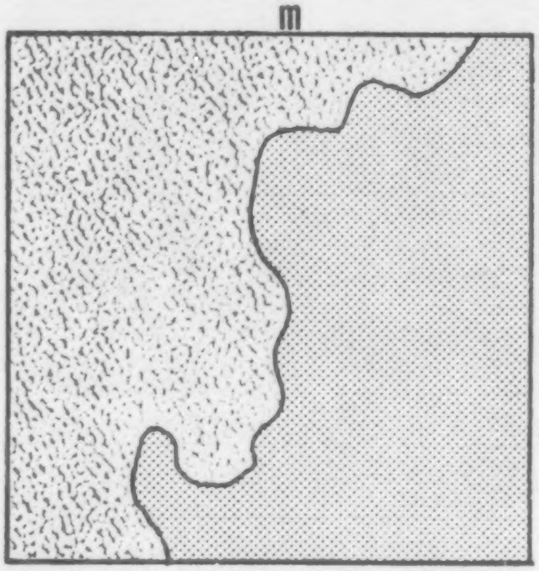

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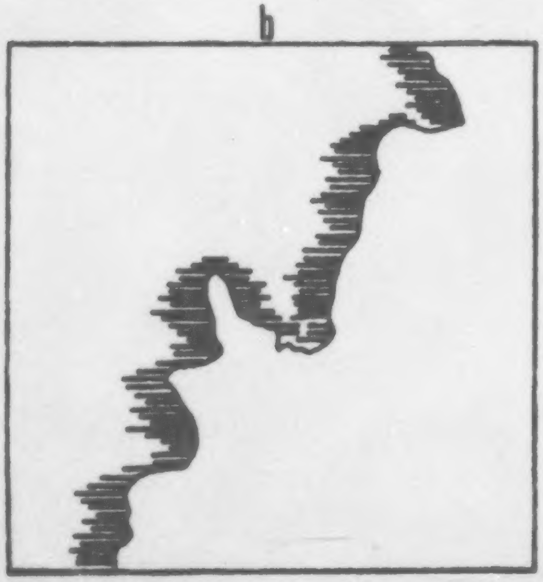

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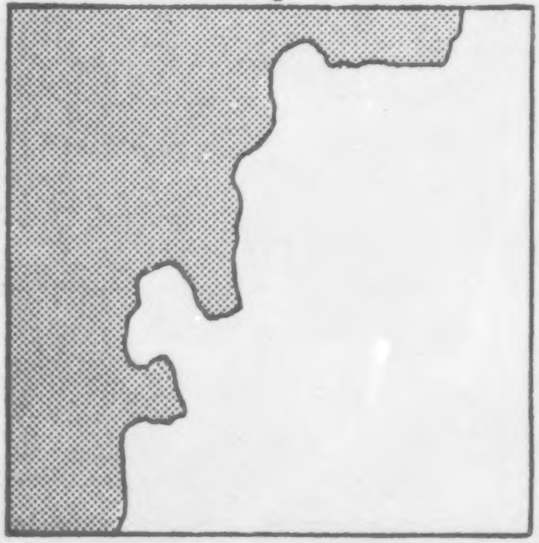

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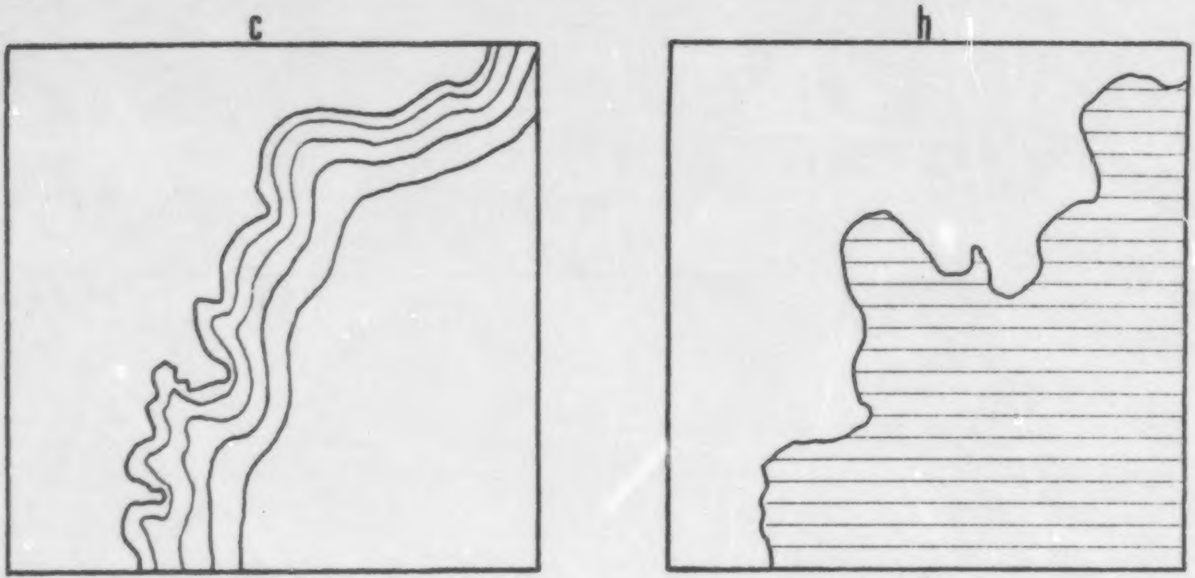

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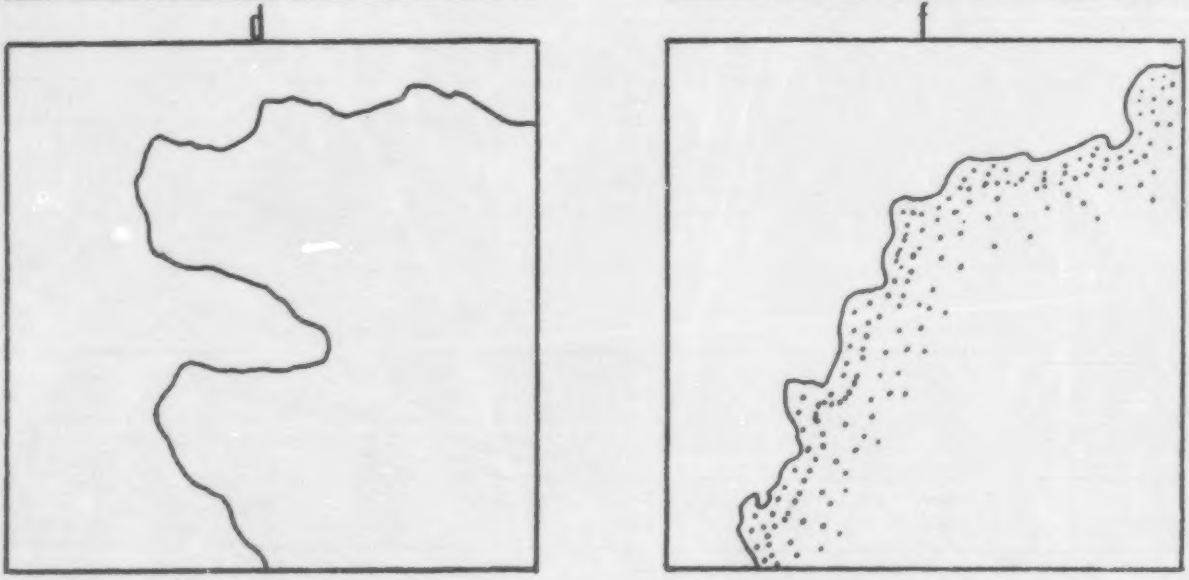

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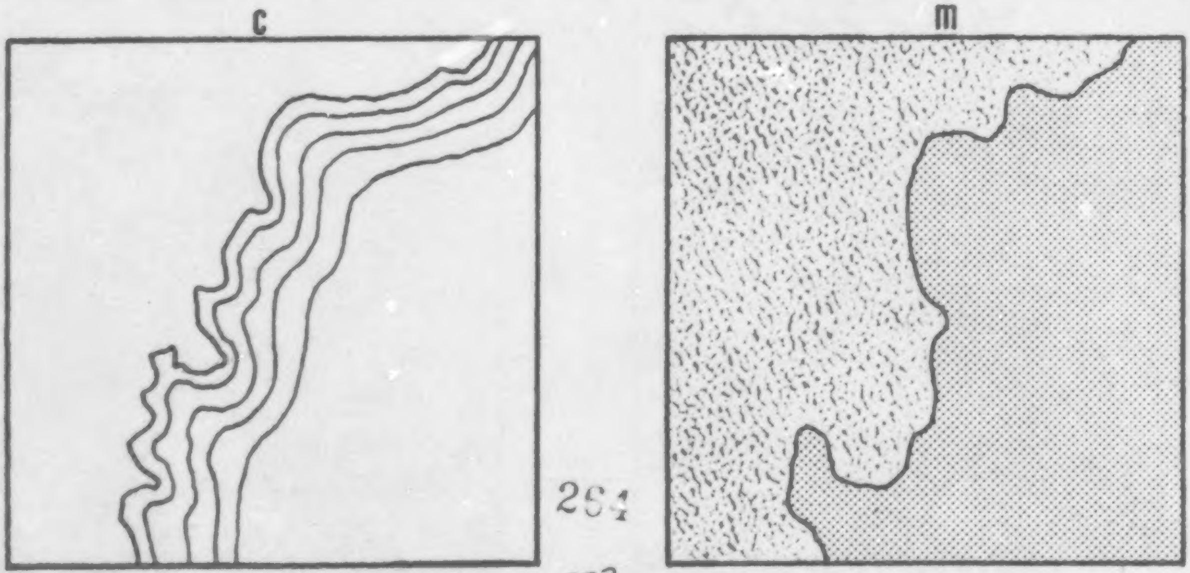

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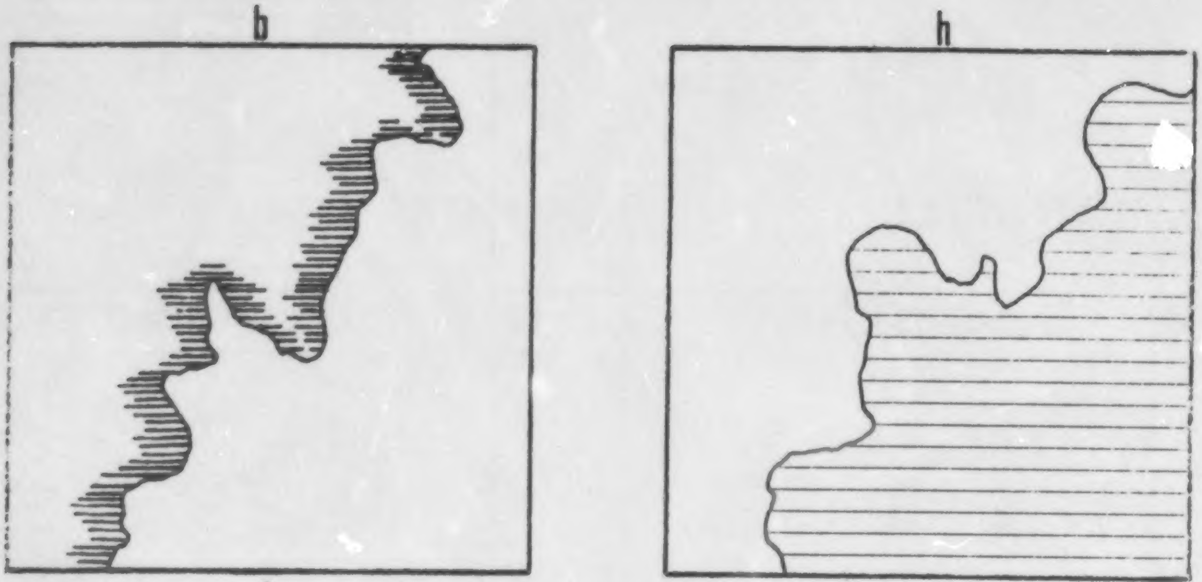

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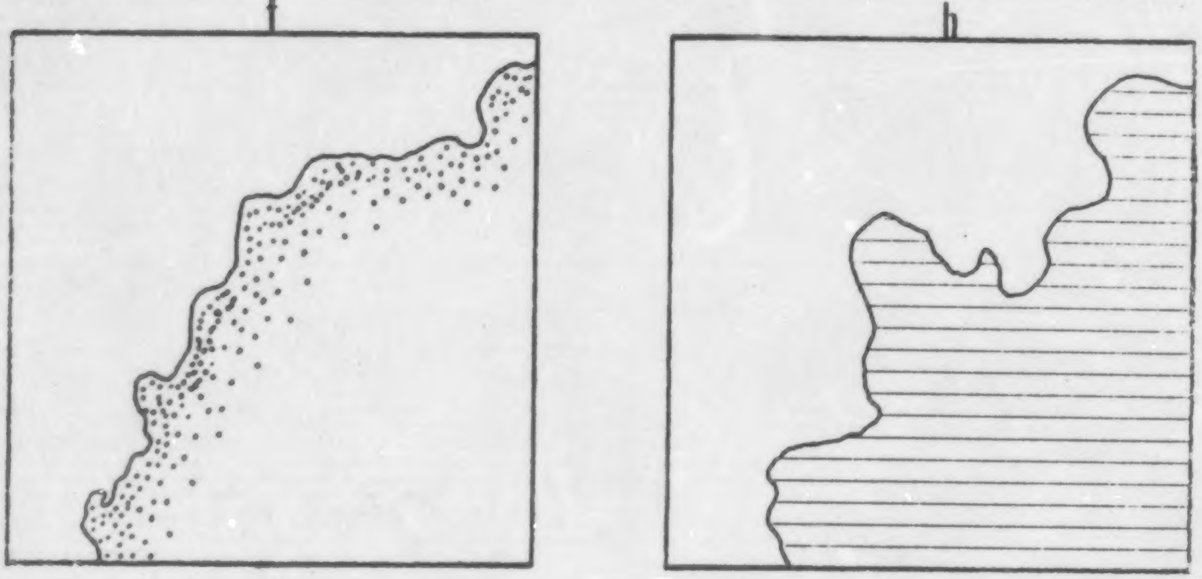

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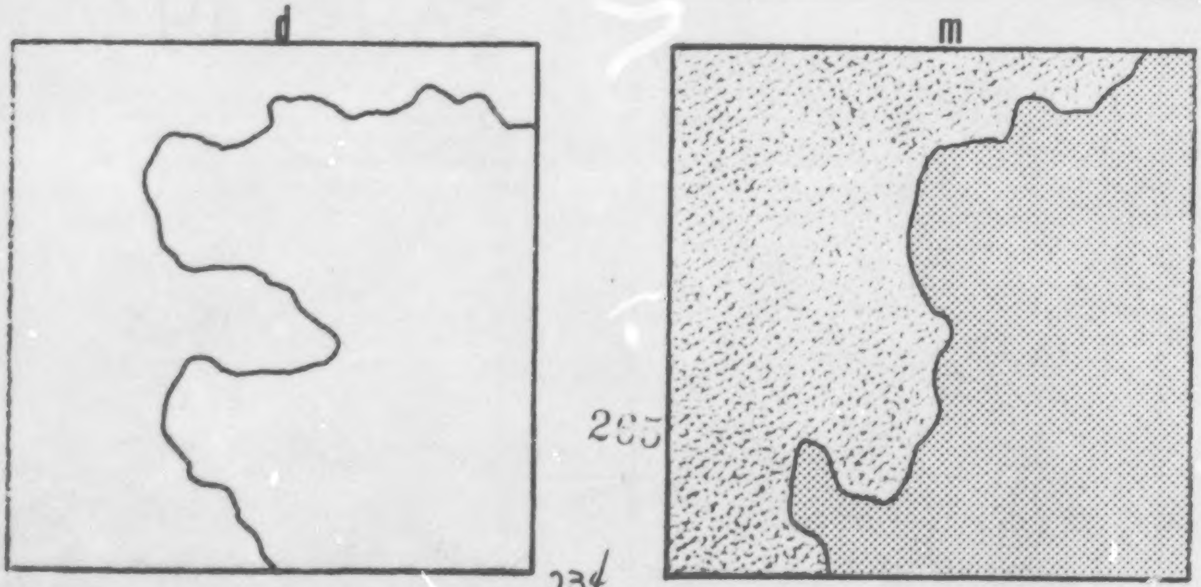

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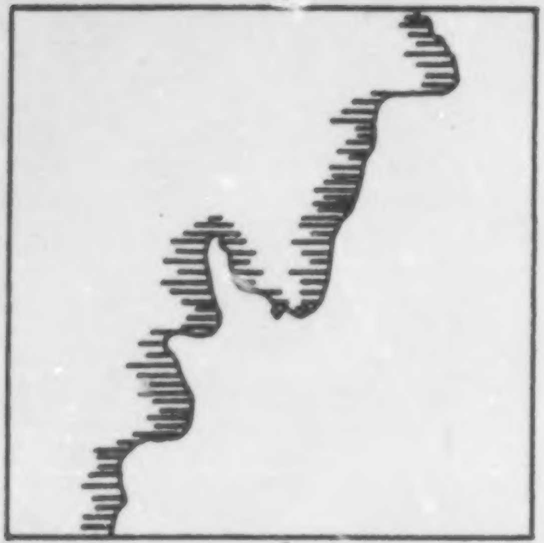

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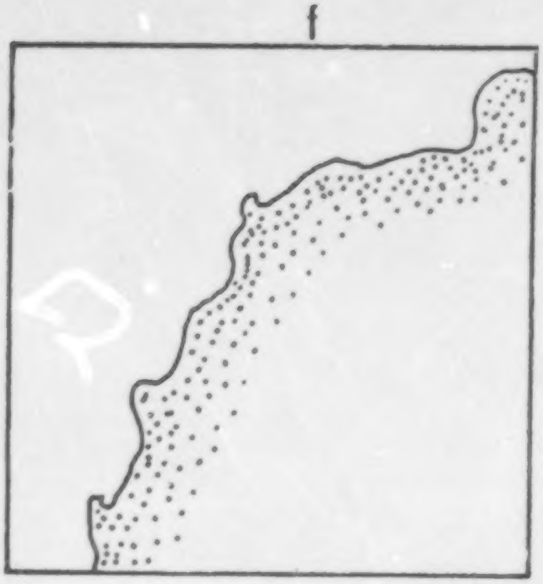

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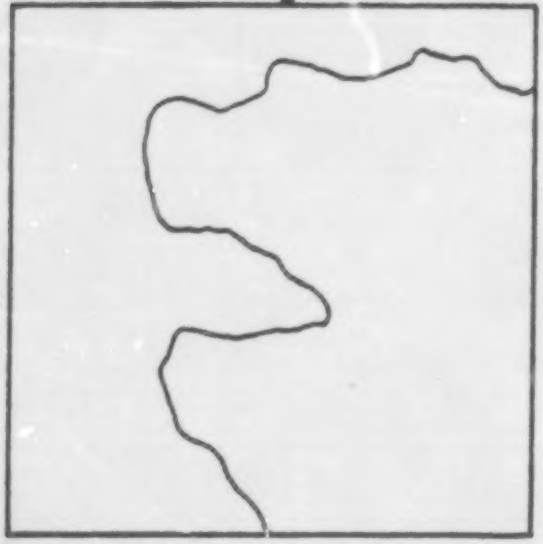

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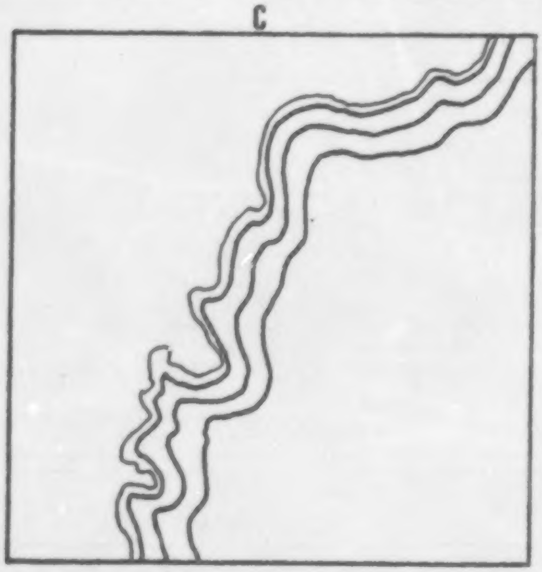

21.

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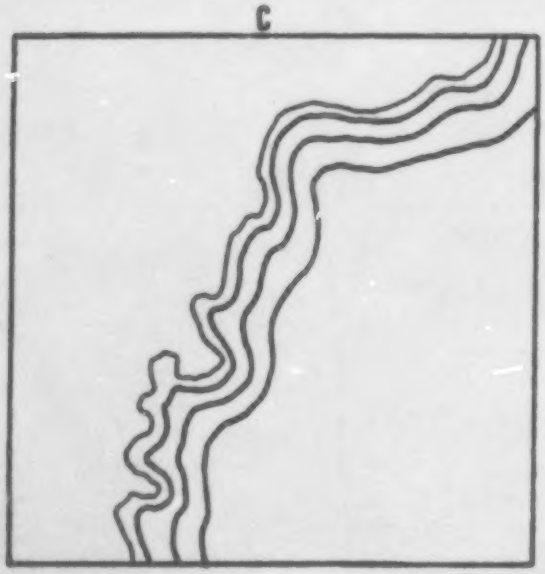
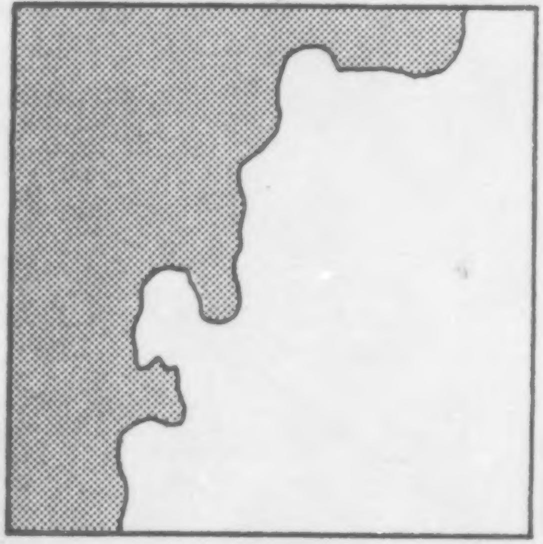


e



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APPENDIX 2

STUDENT RESPONSE SHEET

ANSWER SHEET

1. Are you ☐ male ☐ female ?

2. Do you write ☐ right-handed ☐ left-handed ?

3. What grade are you in?

☐ Grade 4

☐ Grade 8

☐ Grade 12

TASK 1

Map M	☐	☐	Map F	☐	☐
" K	☐	☐	" C	☐	☐
" D	☐	☐	" B	☐	☐
" J	☐	☐	" H	☐	☐
" L	☐	☐	" E	☐	☐
" A	☐	☐	" G	☐	☐

TASK 2

1	D	B	11	F	M
2	B	C	12	B	E
3	E	F	13	C	H
4	D	H	14	B	F
5	E	M	15	C	M
6	C	F	16	B	H
7	D	E	17	F	H
8	B	M	18	D	M
9	H	M	19	B	P
10	E	H	20	D	C
			21	C	E

OBJECTIVE ANALYSIS OF SCHOOL ATLASES

by BERT SANDFORD*

Abstract. A method of objectively comparing school atlases is described and examples are given of its use.

THE PROBLEM

Teachers of geography are aware that neither reviews nor publishers' advertisements provide sufficient guidance for the selection of a new school atlas. Not only are crucial questions unanswered (are the maps too 'noisy' or overcrowded with names?) but the information is often too vague to be of much use (how large is 'large format', how long is a 'long learning programme'?).

There is a need for objective comparative reviews to aid selection, but the literature provides little guidance to criteria for such an analysis. Peucker's paper survives only as a summary (Peucker, 1893) with which few would quarrel even today. The Geographical Association has set out a list of desiderata (Geographical Association , 1953) and this was closely followed by Milne (Milne, 1971). The only major departure was Milne's rejections of the Geographical Association's plea for a reduction in the density of names on atlas maps. Sandford's recent paper on this theme incorporates new evidence and the results of a growing body of research data (Sandford, 1980).

A short list of the more significant criteria in the literature has been drawn up and objective methods of quantifying these designed. A table of the results is to be published by the Geographical Association (Geographical Association, in press), while the analysis itself has proved to be a valuable tool for investigating the nature of school atlases (Sandford, 1978) and publishers have used it for long term planning.

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ATLAS CONTENT

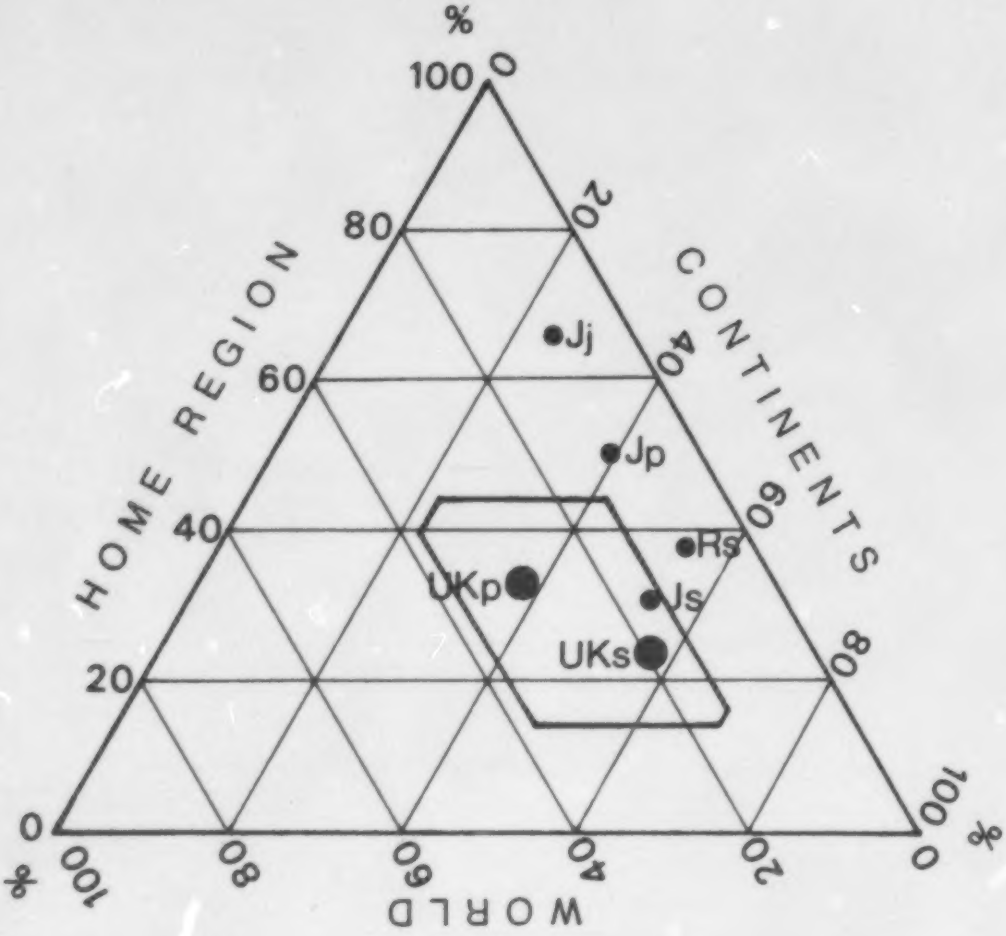
The contents of the atlases were analysed using a tenth of a page as the unit of measurement. The relevant statistic was thought to be the total amount of teaching material - not just the maps - whether in the body of the atlas, in the end papers or even on the cover. The gazetteer and 'contents page' are omitted on the grounds that they are tools rather then content. Title page and credits are also ignored.

Many atlases devote some pages to a learning programme to teach the use of scales, symbols and so forth. The United Kingdom primary school atlases average only two pages of learning programme but Jacaranda's Australian Primary Atlas of 1978 has one of the finest yet published and occupies twenty pages. Refer to Figure 1.

The remainder of the teaching material is broken down into the percentages devoted to the world, the continents and the 'home region' (the British Isles in the case of the United Kingdom atlases, and Australian and New Guinea for the Australian atlases). Figure 1 shows that the Jacaranda and Rigby Australian atlases analysed tend to emphasize knowledge of the homeland at the expense of a global view to a greater extent than United Kingdom atlases. Refer to Figure 2.

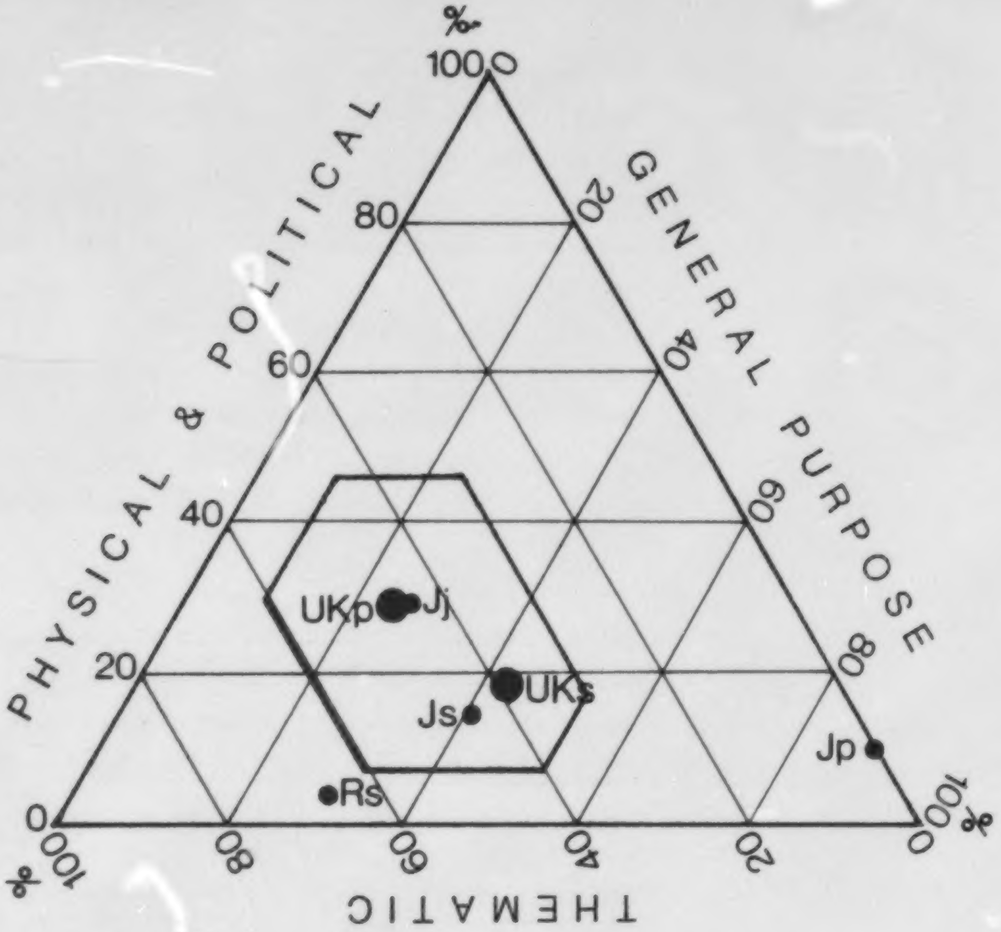
The teaching material is also classified according to its purpose: physical geography, political geography, combined physico-political (general) geography and thematic. Teachers commonly prefer the bulk of maps in any atlas to be general (towns, states and communications on a map of relief and drainage) as these bring together the human and physical sides of geography. Purely political and purely physical maps are then usually relegated to smaller scale insets along with thematic maps of population, climate and the like.

Some teachers prefer page opposed pairs of physical and political maps, very common earlier in the century. Used separately, they present a spurious and delusive simplicity. They are truly meaningful only when their informational content is fused together in the mind to reveal the interplay of physical and human geography. Children do not have this skill and so general maps are more desirable. This is recognized by the Rigby and Jacaranda atlases and by most United Kingdom ones (Figure 2). The separate information for thematic material is useful in view of the changing roles of regional and systematic geography in the syllabuses. Rigby's Australian Atlas makes a very full provision of such resource material but it is neglected in Jacaranda's Australian Primary



Jj	Jacaranda Junior World Atlas (for W.A. Primary Schools), 1972.
Jp	Jacaranda Australian Primary Atlas, 1978.
Js	The Jacaranda Atlas, 1969. (Secondary).
Rs	The Australian Atlas, Rigby, 1979. (Secondary)
UKp	mean of United Kingdom primary school atlasses
UKs	mean of United Kingdom secondary school atlasses
▱	interquartile range of UK atlasses (enclosing 50% of all UK atlases).

FIG 1: ANALYSIS OF ATLAS CONTENT: REGIONAL CLASSIFICATION



Jj	Jacaranda Junior World Atlas (for W.A. Primary Schools), 1972.
Jp	Jacaranda Australian Primary Atlas, 1978.
Js	The Jacaranda Atlas, 1969. (Secondary).
Rs	The Australian Atlas, Rigby, 1979. (Secondary)
UKp	mean of United Kingdom primary school atlasses
UKs	mean of United Kingdom secondary school atlasses
⬡	interquartile range of UK atlasses (enclosing 50% of all UK atlasses).

FIG 2: ANALYSIS OF ATLAS CONTENT, SYSTEMATIC CLASSIFICATION

Atlas.

The conventional general purpose map has a physical base of hypsometric colours (altitude tints), but an increasing number of European publishers are turning to general maps with an environmental (landscape) base, the latest being Bartholomew's First Atlas of the Environment with a very full learning programme to explain the colours. These refer, not to the relief, but to forest, pasture, cropland, desert and other habitats that differentiate the various parts of the 'episcape', the global skin on which we live (Sandford, 1979). On these maps the relief is represented by gradient shading (hill shadow) and by separate, smaller scale inset maps. Environmental maps have been found superior for most geographical teaching (Sandford, 1979) and with their wider use a revised analysis will have to find space to give them a separate listing.

The presentation of the material on the home country merits special consideration. United Kingdom atlases portray the British Isles in Maps (90%), pictures (8%) and ancillary matter such as diagrams and text (2%). There is good evidence supporting the greater provision of pictures (Sandford, 1972) and Rigby's Australian Atlas provides 19.6%.

VIEWING AREA

A map size of 10" by 9" (255mm by 203mm) has been advocated for secondary school children and most atlases tend to conform to this prescription. Larger maps cannot be seen as a whole and so have to be scanned: a skill that is latent but undeveloped in young children (Sandford, in press). The viewing area, defined as the largest size of map normally to be found in the atlas (and generally equivalent to one page), tends to be just as large in primary school atlases and presumably too large.

A more detailed analysis would have to take into account the fact that we have two eyes working together and therefore an elliptical cone of vision with the longer axis horizontal. It is therefore easier to read a map of Australia or Canada than one of Japan or Chile. Atlases are traditionally bound with their longer axis vertical and this becomes a major determinant of map scale and orientation, and even of the selection of areas for larger scale treatment. The vertical presentation is ideal for printed text, which must be scanned, and for which long lines of print would result in a loss of continuation from one line to the next. It is not necessarily appropriate to an atlas however and perhaps a departure from this tradition would lead to more maps being of a convenient area, scale, shape and orientation. It would certainly be an advantage for any country that itself is longer from west to east than from north to south. Australia, with or without New Guinea and New Zealand, could occupy a full page without turning the atlas round and therefore make map comparisons easier.

GAZETTEER

A gazetteer (index) may be complete or selected. This information is helpful to teachers as a long gazetteer (and therefore a small typeface) is very daunting to children and contains many redundant entries, names that will rarely if ever be needed. The Australian secondary atlases analysed have very formidable gazetteers.

The type of co-ordinate system is also important. The ability to use a gazetteer is an essential skill and many teachers would encourage its use by providing an atlas employing the letter-number (alpha-numerical) system. Others regard this merely as an introduction to the concept of geographical co-ordinates and believe that pupils must be able to handle geographical co-ordinates of latitude and longitude by the time they leave school. This is not merely because a proficiency in their use is a requirement of most leaving examinations, but also because they are needed for adult atlases, for an understanding of time, for navigation and, more fundamentally, because they form the only invariable global system: the letter-number system is idiosyncratic and applicable to only a single map in a specific atlas. Geographical co-ordinates are also a constant reminder of the roundness of the world and their drawn parallels and meridians visually reinforce the child's concept of global shape. Many teachers like a 'family' of atlases in which the gazetteer gives geographical co-ordinates in whole degrees for the younger child, then fractions of degrees and finally degrees and minutes for the older pupils.

For the youngest child some teachers prefer qualitative or quantitative descriptions, eg. "Melbourne, capital city and port, New South Wales, Australia", or "Reading, country town on the River Thames, 61 km W of London". These are however far from easy for young children though they provide excellent practice in scanning, scale and direction.

A few atlases print names in the gazetteer in the same typestyle, roughly at the same size and sometimes also in the same colour as they appear on the map to which the pupil is referred - most valuable in providing him with an appropriate 'mental set' that enables him to find the name on the map more quickly. This characteristic of a gazetteer was not chosen as a criterion for the comparative analysis as there are as yet too few exemplars. In addition, it would be more appropriate to combine it with an assessment of the efficiency of the typographic code used on the maps themselves, but despite a considerable volume of research few clear indications have emerged as to the most suitable typefaces. Refer to Figure 3.

PICTURE DIFFICULTY

Seven criteria used in comparative analysis are given a 10-point scale, from 0 to 9, so as to provide objective indices. A low value (0) does not necessarily mean 'bad' nor a high value (9) 'good'. These would be value judgements inappropriate to an objective analysis.

An Index of Picture Difficulty (Figure 3: A) was considered desirable as it is well known that high altitude, vertical, black and white photographs of physical features, at one extreme, are far more difficult to comprehend and far less interesting to children than close-up, horizontal, coloured, artist's pictures of familiar objects with 'the human touch', at the other extreme (Long, 1953, 1961). Rigby's Australian Atlas has a very generous provision of pictorial material with some interesting satellite images but much of it is rather difficult for children to interpret.

INTEGRATION AND METRICATION

The Index of Integration measures the proportion of teaching material providing historical, economic, social, biological and other information important to the increasing number of teachers involved in some form of integrated studies: environmental studies, social studies and the like. This includes maps of historic periods, per capita income, wildlife distribution and so forth, but not the more traditional and customary atlas maps of exploration, population and trade. So far even atlases claiming to cater for such work fall far short of what is required.

The Index of Metrication described the extent to which metric have replaced imperial units and will doubtless be obsolete within the next few years.

DENSITY OF NAMES

Research shows that the density of names on a map is crucial to the rapid and accurate location of any one of them, and also to the more general comprehension of the map as a whole. In addition, the child may be deluded into a false impression of overcrowding or desertion. For a child of a given age there is an optimum density of names but there is little agreement as to what this density is.

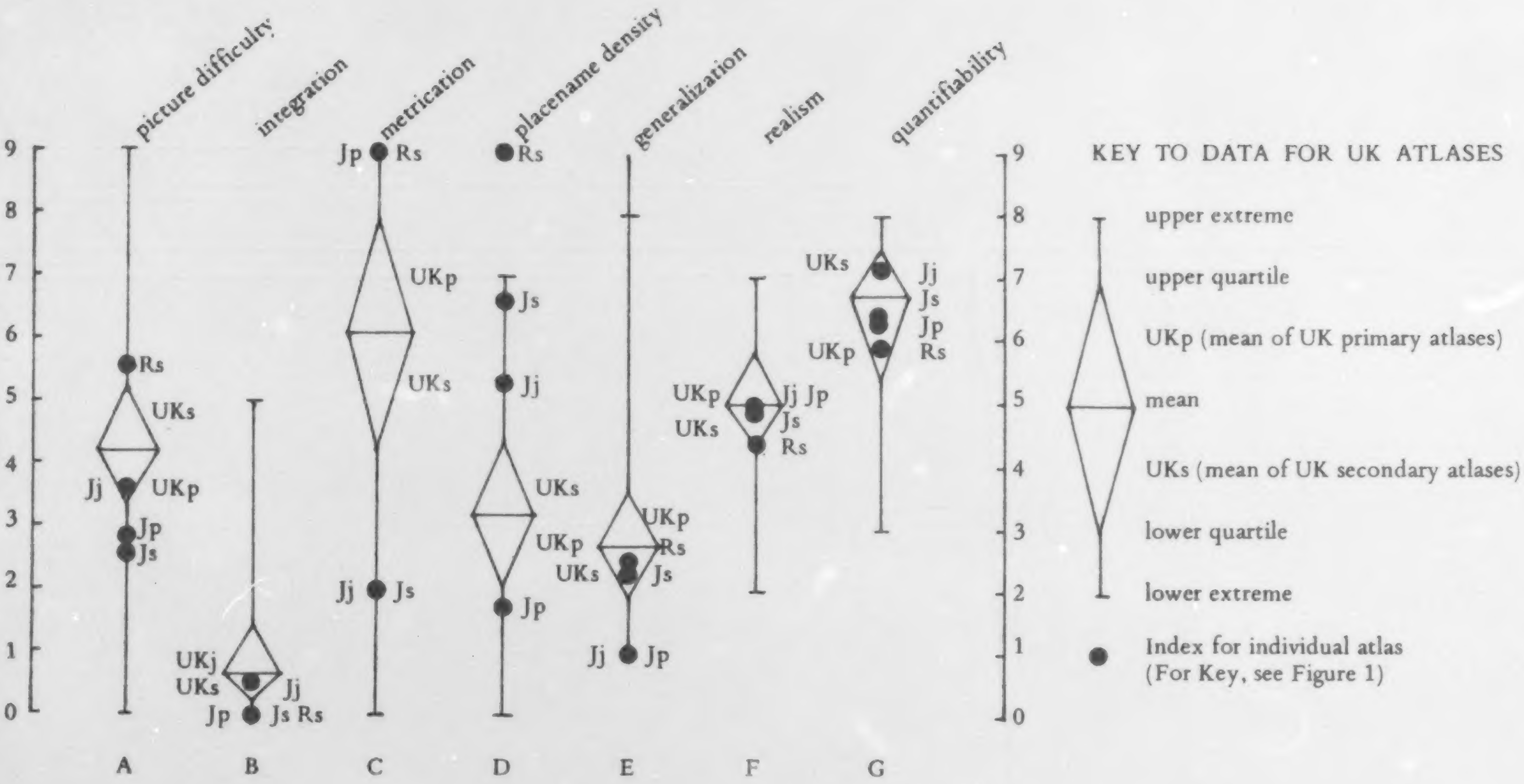


FIG 3: APPLICATION OF INDICES OF PICTURE DIFFICULTY TO SELECTED ATLASES

The Index of Placename Density is derived from a small sample: a simple count of the number of named towns in 15 cm^2 centred on Strasbourg on the main placename map of Europe, ie. the map to which the pupil is referred from the gazetteer. For the Australian atlases 15 cm^2 of land area centred on Sydney was taken as the sample. Figure 3: D shows that Rigby's Australian Atlas is singularly rich in placenames.

Many cartographers adopt different levels of density for home region, continental and world maps. A lower density is given to physical names (headlands, lakes, peaks etc.), making it difficult for children to relate physical to human geography. A more valid Index would therefore employ a more representative sample of names.

Besides the simple count of names per unit area is an interrelated complex of qualities that defy mensuration - obtrusiveness, familiarity, readability and so on - and the whole determines a highly relevant but most elusive quality: 'subjective name density'. Of great importance to this are the choice of typography, the typographic code and the explanation of the code. Too little is yet known about the way these work and few atlases explain their employment of different typefaces, presumably because this would so often reveal them to be illogical, inconsistent and misleading.

The factors that determine which features on the maps to names have been little studied though the choice clearly affects the kind of world the map portrays. The practice in regard to cities and towns is to provide a town stamp and a name for all census enumeration districts (or contiguous groupings of them) returning above a certain minimum population. The result often has little to do with actual towns as physical entities in the landscape, particularly as the usual practice is to use secondary or derived data. This is a tradition and reconsideration is long overdue (Sandford, in pre.).

GENERALIZATION

The generalization of map symbols involves a reduction in their number (eg. fewer islands and railways) and a smoothing of their lines (eg. the loss of meanders and headlands). Reduction in scale enforces generalization and affects atlases in particular. These are made more abstract and therefore more difficult to understand than large scale topographic maps - it is more difficult for children to mentally visualize the reality behind the maps, the reality that is necessary to all meaningful and accurate atlas mapwork (Sandford, 1972).

Generalization due to scalar change is called 'technical', and if any map is no more generalized than its scale necessitates, it shows every true-to-scale feature that can be drawn in the thinnest visible line. For the map to be readable the cartographer must inject further generalization and this is called 'editorial'. When this is carried too far the map ceases to carry a correct visual impression of the complexities of the real world. It may be easily read by very young children but the message it conveys is of scant value and most misleading. Thus there is an optimum amount of editorial generalization to be added to the inevitable technical generalization. We know little about this optimum level but there is some evidence that generalization has gone too far in some primary school atlases. The Australian atlases analysed well reflect the complex real world (Figure 3: E). Some of the Jacaranda atlases, however, are perhaps too replete with rivers as it is difficult for children using them to follow a river from mouth to source.

The Index of Generalization is derived from two samples, the number of islands off the Norwegian coast and the number of lakes in Finland, both taken from the main map of Europe. Scale adjustment was made according to Topfer's Radical Law (Topfer & Pillewizer, 1966). A revised Index could usefully employ a wider range of samples as it seems that cartographers apply different levels of generalization to rivers, coastlines, contours and peaks. The omission of town stamps in this context is of small moment (so long that there is retained the outmoded convention of naming all towns shown) for towns are separately treated in the Index of Placename Density. It could be that generalization has tended to go too far in respect of physical background but not always far enough in regard to settlements.

Purposeful generalization following acceptable rules does not constitute inaccuracy in the strict sense and the teacher at least knows how to allow for it. But all too often a school atlas map has a wealth of misplaced or entirely spurious detail, most noticeable with coastlines. The best that can be said is that they may give an appropriate overall impression of, say, the intricately fjorded Norwegian coast. Small errors ride on the back of wholesale displacements, and when they are combined with editorial generalization, neither the one nor the other can be quantified in pure form. This clouds the Index of Generalization and obfuscates any Index of Accuracy.

QUANTIFIABILITY AND REALISM

The quantifiability of a map is here defined as the amount of numerical data that can be extracted from it and the ease with which this can be done: the co-ordinates of a town, the height of a summit, and so forth. For many decades there has been a decrease in the quantifiability of maps in school atlases through the use of subtler hypsometric colours, often not separated by any clear contour, and the replacement of numerical statement by verbal description in some primary atlases: 'highland' and 'rainy' in lieu of precise figures. With the decline of 'capes and bays' geography teaching, this loss of data was acceptable and it enabled the maps to achieve a greater realism - a visually smoother relief better reflects reality and the child is less likely to imagine a landscape of cliff-bounded terraces. The introduction of gradient shading (hill shadow) lent further realism.

But the rise of quantitative geography since the Second Madingley Lectures in 1965 has brought a renewed demand for precise data and according to a more rigorous prescription. Pupils might now be required to plot the altitudes of the South American capitals against their latitudes, to compare the indices of railway connectivity in Russia and China, or to examine the hierarchical nature of settlements in Australia.

Realism and quantifiability are to a considerable extent mutually exclusive and it is most important to the teacher to know whether an atlas he is considering for purchase has achieved sufficient of the one quality without undue loss of the other. Most publishers have aimed at a compromise, both in the United Kingdom and in Australia (Figure 3: F, G).

The Index of Quantifiability is derived from a number of weighted criteria such as the number of hypsometric colours, the contrast between them, the precision, variety and completeness of scale description and their repetition on each map page. The Index of Realism makes use of such criteria as the use of gradient shading, the lack of contrast between hypsometric colours, a low level of generalization, the addition of landscape colours or point symbols, and so forth. The employment of a strictly arithmetic or geometric scale for altitudes also scored for realism as it has been found that such scales produce a more realistic impression of relief (Sandford, 1976). A revised Index of Realism should include the clarity of the co-ordinates, the use of inset globes and the curvature of names, for all these are indicative of the roundness of the world.

CONCLUSION

Objective analyses such as the one described here are unable to bring out any special or distinctive feature that any particular atlas might possess. To attempt to do so would require so many criteria that the resulting comparative analysis would be too unwieldy. It is therefore necessary to append a qualitative description to the quantitative analysis. For the Australian atlases analysed it may be said that between them they have many innovative, progressive and original features in their learning programmes, emphasis on the homeland, and use of high altitude photos, sample studies and metacartography. Comparative objective analysis helps towards a better understanding of atlases, aids their selection and could lead to improved design.

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READING AND UNDERSTANDING GEOGRAPHICAL MATERIALS

by KEVIN J. LAWS*

Abstract. Developing reading skills within content areas has become of significance in education in recent years. This paper outlines empirical findings associated with the mathemagenic model and identifies some of the principles involved in reading behaviour. These principles were used in producing expository materials in historical geography and an experimental situation was set up to test the effect of two different strategies which were both based upon the mathemagenic model. From this experiment came a number of suggestions for further research into reading and teaching strategies.

Increasing concern and awareness had been shown in recent years in the area of instruction in reading. The Reading K to 12 curriculum policy statement released by the N.S.W. Department of Education emphasises the necessity for reading to be considered as an essential part of the educative process in both primary and secondary schools. There has also been attention given to reading as an across the curriculum component of most subjects taught in schools.

Geography and Social Studies courses are two areas which highlight the importance of reading skills. Students are expected to use textbooks and other written materials to gather information as a data base for further learning. Recognition of the use of textbooks in Social Studies courses resulted in the issue of a special bulletin of the National Council for the Social Studies on improving the use of Social Studies Textbooks. Numerous journals have included articles on aspects of reading of importance to Social Studies teachers. In 1977 Lunstrum and Taylor provided a review of research findings in the field of reading instruction and gave a series of valuable ideas and strategies for teachers of Social Studies.

Some of the skills of reading which can be accomplished through geography and social studies instruction have been identified as following directions, skimming, locating main ideas, locating specific information, distinguishing fact from opinion and reading for detail and to identify organisation. Some activities and strategies have been developed to assist students in making summaries and outlines. Reading activities can also contribute to the students' development of geographical concepts and specialised vocabulary. The development of students' general and specialised reading comprehension skills appears to be a major area to which geography teachers can make a worthwhile contribution. Questioning as an aid to the development of skills in reading comprehension has long been used by teachers. The purpose of this paper is to present some of the findings associated with the use of questions with written expository materials, to outline an empirical study designed to apply some of these findings to the classroom and to suggest activities and strategies which might be adopted in geography lessons.

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THE MATHEMAGENIC MODEL

The mathemagenic model, developed by Ernst Rothkopf (1970) suggests that written questions can shape the way in which an individual reads. Mathemagenic behaviour involves a variety of on-going activities such as the adjustment of the head and body towards the printed page and the movement of the eyes over the page. In addition to these physical activities students engage in other mathemagenic activities which include identifying the theme of the passage, distinguishing some facts as being of greater importance than other facts, developing new concepts, and learning new words. Rothkopf hypothesized that these activities can be brought under the control of test-like events, such as questions, which occur in conjunction with the reading materials. If students can correctly answer adjunct postquestions the mathemagenic behaviour used during the reading are reinforced and will continue to be used in future reading. If a student cannot answer all questions correctly the behaviour will be modified. The questions provide cues as to what students should look for when reading passages in the future. In other words the questions are seen as reinforcing or modifying the way in which students read so that future reading might be improved or made more efficient.

It is worthwhile considering some of the findings associated with the mathemagenic model as these form the setting for the empirical study to be outlined later. A number of practical matters associated with the use of questions with written expository materials have been the focus of research (Laws 1980). These include What is the most effective position for questions? Do questions requiring different levels of cognitive processing result in different effects?

Which format of questions is most effective? How frequently should questions occur? Does learner aptitude influence the effect of question position, type format and frequency?

It has been found that questions placed after a passage, be it a paragraph, section or chapter, result in more effective learning than questions placed before a passage. Pre-questions result in the learning of information related specifically to the questions. Post-questions result in the learning of information related not only to the questions which were asked but also to information which was not asked for in the post-questions. It appears that pre-passage questions restricted students' attention to specific parts of the material presented whereas post-passage questions required more careful reading of the entire text.

Very few studies have explored the relationship of question type and positioning of questions. No studies have used the entire taxonomy of cognitive abilities such as those developed by Bloom (1956) or Sanders (1966). Most studies have used questions requiring only verbatim recall as a measure of learning. Those studies which have utilised different levels of questions, Watts and Anderson (1971), Felker and Dapra (1975), found that questions demanding application and comprehension facilitated later performance. It was suggested that these levels of questions encouraged students to process the content of instruction more thoroughly in an effort to apply it to unfamiliar situations.

Most studies involving the mathemagenic hypothesis have utilised a multiple choice question format. One study (Frase 1968) compared a multiple choice format with a constructed response format. Frase hypothesized that a constructed response such as a sentence would require students to process the information to a greater extent. However, the results indicated that the question format produced no statistically significant difference in relation to the retention of information.

Studies into the optimal frequency of questions with expository materials have produced conflicting results. Frase (1967, 1968) concluded that both frequent (i.e. after 10 lines or sentences) and infrequent questions (i.e. after 40 lines or sentences) are necessary depending upon whether emphasis is placed upon the retention of selected facts or the comprehension of the total passage. A study by Rickards and DiVesta (1974) used factual and meaningful questions. They found that only meaningful questions were influenced by question frequency. They suggested that meaningful questions induced more thorough processing of a passage and should be spaced relatively close together so as to minimise the cognitive strain upon the student.

Koran and Koran (1975) hypothesized that the optimal frequency of questions would vary with the learners' ability to process and store printed information. Their results suggested that frequent selective reinforcement of students' attention to specific aspects of a printed passage through the use of questions may reduce the burden of semantic processing required and capitalise on the role of associative memory. The insertion of frequent questions may compensate for the lack of attentional and discriminatory skills in lower-ability students through their attention-directing and attention-controlling features.

Many of the studies involving the testing of aspects of the mathemagenic model have used situations dissimilar to actual classroom practice. Most of the studies have been carried out with tertiary level students with materials in educational psychology. Some studies were conducted over relatively short periods of time, ranging from 30 minutes, 12 paragraphs or approximately 800 words. Often the questions were positioned at highly controlled intervals, for example after 10, 30, 40 or 50 lines. This meant that materials had to be specially prepared or questions would not occur at natural breaks in the prose passage. In the study which is outlined in the following sections attempts were made to overcome some of the difficulties associated with previous studies.

DEVELOPMENT OF EXPOSITORY MATERIALS

A curriculum unit based upon an historical geographical approach were prepared to test some of the aspects of the mathemagenic model (Laws 1978a). A sequence of occupance approach, utilising both cross sections and vertical themes, was used to structure the materials (Figure 1). Each chapter in the text dealt with one cross sectional period of time. Within each chapter were sections dealing with each of the following vertical themes: technology, economy, social organisation, population, settlement pattern, transport and communication. This format resulted in six chapters ranging between four to seven pages in length, with sections ranging from sixteen to eighty lines. Despite the apparent variability of the length of sections, each formed a coherent unit related to one specific theme.

The concept load, vocabulary and sentence structure was checked and the readability of the materials was measured on the Extended Fry Readability Graph. This indicated that most of the text was at eighth grade reading level although parts were up to two grade levels above this. One reason for this

	STAGE	VERTICAL THEMES					
		Technology	Economy	Social Organization	Population	Settlement Pattern	Transport and Communication
CROSS SECTIONS	1. Indian settlement before European contact.						
	2. Indian settlement after European contact.						
	3. Pioneer white settlement.						
	4. Peachtree Street as a commercial and fashionable residential street.						
	5. Peachtree Street as a commercial and high density housing street.						

Figure 1 Organization of content for curriculum materials.

which were considered an essential part of the learnings for students using the materials. Another factor leading to the higher readability scores was the use of proper nouns and dates in the text. For example the year 1821 is scored as one word and five syllables on the extended Fry graph but should not cause an eighth grader as much difficulty as a word consisting of five syllables. Over forty maps, photographs and sketches were incorporated into the text and numerous tables of information were included to illustrate specific points.

An integral part of the materials design was a student workbook which contained the questions which students were to answer after reading required text passages. The workbook was structured along the same format as the text. It consisted of questions related to each chapter, organised according to the themes running through the materials. Four question types were utilised with each theme. A series of vocabulary questions which involved the definition or explanation of important terms used in that section of the text were prepared. A number of factual questions related to each section of the text were posed. These questions focussed upon facts considered to be of major importance and were answered by having students write the correct word, phrase or sentence in the space provided. Some questions required students to sythesize the factual information into generalised statements. Transfer questions were the fourth type. These required students to apply knowledge learned from the materials to an unfamiliar setting in which similar principles operated. Each question type was related to a specific reading comprehension skill. In addition to the question types noted above questions were posed about each map, photograph and sketch to help students analyse the material presented. Students were also required to complete tables which summarised information. This exercise was aimed at the comparison of the themes at different stages of occupance.

EXPERIMENTAL TREATMENT AND RESULTS

In the experiment in which the curriculum materials were used the experimental variable consisted of two methods of presenting the written text and the questions (Laws 1978b). One method required students to make written responses in the workbook after reading one section of the text. The other method required written responses to be made at the completion of each chapter. Students were required to answer the questions without reference to the text.

Four eighth grade classes were selected for the experiment. These classes had been streamed by the school authorities into "advanced" and "basic" levels. In order to obtain a measure of the students verbal ability the word meaning section of the Iowa Test of Basic Skills: Level 14, Form 3 was administered.

This test was chosen because of its high reliability (.90), its administrative simplicity and its high intercorrelation with the whole reading test (.82). The correlation between the word meaning test and student achievement as measured by the posttest was .71. Almost 70% of all students were reading below their grade level (Figure 2). In the basic classes this figure reached 90%. Because of this it was decided to omit the results of the basic classes from the study. No significant difference between the word meaning scores of the students in the two advanced classes was found.

Two teachers were involved in the study. Neither had majored in geography but both had a background in the social sciences. One teacher had been teaching for thirteen years and was completing a masters degree in social science education. The other teacher had been teaching for only one year. From subjective observations the more experienced teacher tended to be more "control-oriented". As each class met at a different time of the day it was impossible to randomly assign students from each class to an experimental treatment. A difference was noted in the way students went about their work according to whether they met in the morning or afternoon. The class with the more experienced teacher met in the morning and followed the treatment which required questions to be answered after the reading of each single section of the text.

The study was conducted over an eight week period although instruction took place on only thirty-three days of that time. On the first day the teachers read the Forward from the text and the Note to the Teacher and the Student from the workbook to their class. The students read the introduction from their texts, the texts were collected, and the students attempted to answer the questions in the workbook. This was done to familiarise students with the procedure to be used on subsequent days.

Although it may have been more appropriate to use the class as the unit of statistical analysis it was decided to use the individual student as the unit of analysis because of the limited number of classes used. A series of t-tests were used to determine whether the posttest scores of students using the chapter treatment differed significantly from the posttest scores of students using the section treatment. Comparison of mean scores were made on the mean total gain scores from pretest to posttest, mean vocabulary gain scores, mean factual gain scores, mean synthesis scores, mean transfer scores, and mean scores of each test on chapters 2 through 6.

Table 2

Characteristics of Four Eighth-Grade Classes on Word Meaning Section of Iowa Test of Basic Skills

	Advanced-Average		Basic	
	Class 1	Class 2	Class 3	Class 4
Mean (expressed in grade equivalents)	8.03	7.36	6.11	5.92
Standard deviation	1.39	1.61	1.72	1.31
Number of students above grade 8 level	7	6	1	-
Number of students at grade 8 level	8	9	2	2
Number of students at grade 7 level	8	5	2	5
Number of students at grade 6 level	5	14	6	11
Number of students below grade 6 level	1	2	7	13

The results of the t-tests on gain scores are given in Figure 3 and the results of the t-tests on Chapter 2 through 6 are in Figure 4. With the exception of the test on Chapter 4 there was a significant difference between the scores of students using the two treatments in favour of those reading a section followed by questions. One factor which probably explains the non-significant result in Chapter 4 is that the students reading the whole chapter before answering the questions were supervised by a substitute teacher at this time who did not ensure that students were unable to refer to their text while answering the questions.

Although these results indicate the relative advantage of reading one section at a time and then answering questions related to that section a number of limitations to the internal and external validity of the study are apparent. The study was carried out using an available pool of eighth grade students and needs to be replicated on a larger scale. The readability level of the materials and the reading ability of the students was too disparate. Most importantly the difference in the teachers' experience, the classroom climate and the time of day at which the classes met could all act in favour of the reading by section treatment.

RESEARCHER OBSERVATIONS

Despite the need to accept the results of the study with some reservations the experimental situation provided some interesting insights into aspects of students reading behaviour and teaching strategies. The following comments are based upon frequent observations of the classes made during the period the materials were being used.

The experimental requirement that students were not to refer to the text when answering questions caused difficulties for many students at first. These students were usually not required to read expository materials for the express purpose of remembering what it is they were reading about. If questions were posed either before or after the reading of a passage students had been permitted to search for the answers with the result that their general comprehension of the passage suffered. It also seems that students need to be taught ways of processing information in order to retain it. It is not sufficient just to pose questions about a passage. The mathemagenic model suggests one way in which this might be done.

It was found that the students were not accustomed to writing constructed responses

Table 3

Summary of t-Tests on Gain Scores from Pretest to Posttest

	Treat-ment	Mean	SD	t-value	df	Two-tailed probability	Significance
Total gain* scores	2	20.32	8.84	4.2016	41-1	0.0001	Significant in favor of T2.
	1	11.54	5.90				
Vocabulary* gain scores	2	4.24	3.19	4.1449	37-8	0.0002	Significant in favor of T2.
	1	1.21	1.87				
Factual gain* scores	2	7.52	3.90	2.8978	40-9	0.0006	Significant in favor of T2.
	1	4.86	2.58				
Synthesis gain scores	2	5.36	2.38	3.5256	51	0.0009	Significant in favor of T2.
	1	3.18	2.13				
Transfer gain scores	2	3.20	1.08	2.8020	51	0.0072	Significant in favor of T2.
	1	2.29	1.27				

Note. A two-tailed level of significance of .05 was used.

*Degrees of freedom calculated under the assumption of heterogeneity of variance.

Table 4

Summary of *t*-Tests on Chapters 2, 3, 4, 5, and 6

	Treatment	n	Mean	SD	t-value	df	Two-tailed probability	Significance
Chapter 2 (25)	2	28	13.68	4.99	4.7266	61	0.0001	Significant in favor of T2.
	1	35	8.29	4.07				
Chapter 3 (25)	2	29	15.76	4.92	3.5321	59	0.0008	Significant in favor of T2.
	1	32	11.31	4.90				
Chapter 4 (24)	2	29	14.79	5.35	1.3792	63	0.1740	Non-significant.
	1	36	12.97	5.24				
Chapter 5 (25)	2	29	16.45	4.79	4.3843	60	0.0001	Significant in favor of T2.
	1	33	10.48	5.78				
Chapter 6 (25)	2	29	16.24	5.55	4.6450	59	0.0001	Significant in favor of T2.
	1	32	10.25	4.52				

Note.

A two-tailed level of significance of .05 was used.
The number of items in each test is shown in parentheses.
Degrees of freedom vary due to student absences.

especially in sentence format or the need to support their answers with as much evidence as possible. Most students used only one or two facts to support their argument when additional facts could also have been used. Discussion sessions indicated that many students were aware of much more information than they included in their answers but they had failed to write it down. Students need assistance in planning answers to questions so as to ensure that essential information is provided.

It was of interest to see the way in which the teachers used class discussion sessions. It was thought that a discussion would provide the opportunity to reinforce the correct responses to the questions. However, one teacher used the sessions for students to practice orally their mastery of the information and to identify additional factors which might be relevant to the questions. The other teacher merely used the time for students to complete the questions they failed to answer with a standard response prepared by the researcher.

Two types of workbook questions presented difficulties for students at first. These questions involved vocabulary items and the construction of summary tables. When students began work with the materials it was noted that very few used the glossary or a dictionary to determine the meaning of unfamiliar terms. The low scores on the vocabulary items, especially for Chapter 2, reflect this. As students progressed through the materials they were encouraged to use the glossary and discuss new or unfamiliar terms with the result that scores on vocabulary items improved. The other question type which caused initial difficulties was of importance to the synthesis items which accompanied each section and chapter. The summary tables required students to react selectively to salient elements of a problem and it was these items which were most frequently left incomplete in student workbooks. It would seem that additional instruction was necessary to help students develop the necessary skills to construct these summaries.

An observation of significance to geography teachers was the way in which the students utilised the photographs, maps and sketches which appeared throughout the text. Each one of these items was specifically referred to in the text and yet students rarely referred to them at the appropriate time. It was more usual for students to look at the figure before beginning to read the section of the text and it appeared that some students were unable to see the relationship between the figures and the text. This suggests that further work needs to be done in the area of how students use such material in the hope that techniques and strategies might be developed to assist students in the effective use of items usually thought to add to the understanding of textual materials.

This paper began with the question of reading and geographical learnings. It has been suggested that empirical findings related to Rothkopf's mathemagenic model provide insights into how the reading comprehension of students might be developed. The description of one study utilising geographical materials lead to a number of areas in which geographical educators might become involved in further research.

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WHAT ARE WE REALLY TEACHING?
PUPIL PERCEPTION ON A TEXT BOOK BASED GEOGRAPHY COURSE

by JOHN G. LIDSTONE*

Abstract. *A new geography syllabus for younger pupils, based on the Oxford Geography Project text books was introduced into a comprehensive Junior High School in one of the southern Outer London boroughs. As the first year group of pupils to follow the course completed their third year it was decided to investigate how they, and the pupils one year behind them, perceived their teachers' objectives, the books and the activities in which they were asked to participate.*

The investigation revealed that while pupils found difficulty in using the text books, all regarded their geography course as worthwhile. There is some evidence, however, that pupils perfer more traditional teaching approaches and case studies from areas familiar to them to the problem solving approach and Third World studies.

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Although must emphasis has been placed on preparing geography curricula which reflect new approaches to the subject for those approaching the end of compulsory schooling and many workers have attempted to evaluate such courses, little guidance has been available on the suitability of the new approaches for those pupils in what have become known as the 'middle years of schooling'.

This study was based on a South London comprehensive junior high school where, for timetabling reasons, geography was usually taught to lower school pupils by specialists from other disciplines. Because of this reliance on non-specialist staff it was decided to adopt one of the text book series available and the 'Oxford Geography Project' books II and III were introduced throughout second and third year classes.

The approach to geography teaching adopted in Book II is that of a broad regional framework of Europe, within which theoretically oriented approaches are selected and applied. In Book III, themes related to development are selected from Third World countries. In the second part of the book the matters raised in relation to Third World countries - overpopulation, economic growth, quality of life, rural depopulation, etc. - are illustrated by references to the developed world.

The publishers in their advertising material state that:

> "The emphasis is on precision and participation. Activity-based learning is introduced wherever possible so the pupils become accustomed to applying themselves to concrete situations, weighing up factors involved and offering possible solutions to recurrent contemporary problems."

The authors suggest, in their 'Teacher's Guide', that the debate on the new geography has yielded a core of geographical content that will motivate a child to continue studying the subject:

> "New geography, in its study of man and his environment, deals with socially relevant issues such as population growth, economic development and the quality of the environment ... This reappraisal of the curriculum has been reflected in a steady swing away from teacher-centred learning to discovery learning, in which a child will be motivated by his own sense of the relevance of his activity."

As the first group of pupils following this scheme approached the end of its third year course it was decided to evaluate the courses being offered. In doing so, I was mindful of Parlett and Hamilton's (1975) warning that:

> "the instructional system (the syllabus and text books) may remain as a shared idea ... but it assumes a different form in every situation. Its constituent elements are emphasized or de-emphasised, expanded or truncated, as teachers ... and students interpret and re-interpret it. ... An instructional system, when adopted, undergoes modifications that are rarely trivial."

It was thought important that an attempt be made to discover how the course offered in geography was being interpreted by teachers and pupils and to discover their evaluation of the course's various elements.

RESEARCH DESIGN

The pupil groups involved in the study were four second year (12-13 years) and four third year (13-14) classes - a total of 256 pupils who represented the upper half of the ability range of the school. These pupils were taught by four teachers. The study sought to discover 1) the reactions of the pupils to the text books themselves, 2) their perceptions of the objectives of their geography course, and 3) their own evaluation of selected exercises and activities in the text books and the course as a whole. The instruments used to assess these factors were:

1. A study of pupil reaction to the text books by means of a personal interview of a 20% random stratified sample of sex, year group and teaching set. This yielded forty-eight respondent pupils.

2. A study of pupil perception of course objectives by structured but open-ended writing.

3. A study of pupil evaluation of the various learning experiences which they had undergone by means by a semantic differential questionnaire.

PUPIL REACTION TO THE TEXT BOOKS

An interview technique was selected for this part of the study. Writing of the virtues of interviewing as a research tool, Kerlinger (1964) noted that interviews can obtain information:

> "not only directly by means of a straight question, but also by indirect questioning, and being flexible and adaptable to individual situations, the method is especially suitable for research with children".

However, difficulties arose from my dual role of interviewer and teacher. This was countered by explaining to the pupils that the aim of the survey was the improvement of geography courses for future pupils. Such is the apparent status of market research that all those invited to respond were eager to do so - even after school hours!

The interview started with several general questions designed to put the pupil at ease. These were about reactions to the text book when first presented with it at the beginning of the school year. The pupil's detailed understanding of the text was tested in terms of;

1. readability, comprehension and understanding;
2. impact of photographs;
3. appreciation of the typographic conventions of the book.

Readability, comprehension and understanding were examined in four ways - the pupil's own impression of difficulty, his free explanation of meaning, a structured explanation of meaning and an explanation of the requirements of one of the text book exercises.

1. Each pupil was asked to read privately a passage of about one hundred words selected as being typical of the book and chosen from the latter chapters which had not, at that time, been taught in class. After establishing that the pupil had not read the passage before, I asked if the passage was difficult or easy to understand.

2. The pupil was then asked to explain the content of the passage in his own words, referring back to the book if required.

3. Comprehension of the passage was then further tested by a more structured question which itself stated the fundamental point of the passage. The pupils were then asked to amplify the point with more detail. For example, one such question, based on a passage about the street pattern of Bath, was simply: 'What is the pattern of streets in the centre of Bath and why is there this pattern?'

4. Finally, and following a series of questions about the photographs and variety of typefaces in the books, each pupil was asked to read through one of the exercises suggested and to explain how he would tackle the task.

The second area of consideration in the text books was the impact of the photographs. In 'Oxford Geography Project' books II and III, sixteen and twenty percent, respectively, of the print area consists of monochrome photographs. It was therefore thought important that an assessment of pupil reaction to these be made. This was done by asking each pupil to describe the photographs he remembered best.

The impact of the typographic conventions adopted in the books was evaluated in terms of pupil reaction to the variety of typefaces adopted for the printing of terms representing new 'concepts' (on first mention), text, exercises and activities and captions. Pupils were asked to identify the various typefaces on a sample page and then to explain their significance.

PUPIL PERCPETION OF COURSE OBJECTIVES

In his book, How Teachers Plan their Courses, Taylor (1970) pointed out that teachers regularly claim to be influenced by the interests and attitudes of their pupils in their lesson preparation. However, he noted that little was known about the educational objectives which pupils themselves value or about the objectives that are actually conveyed to them in the courses they study. Taylor's approach to this area was adopted in this investigation. Accordingly, all pupils were asked to copy the following four statements from the blackboard and complete them, giving as many explanations and justifications as they wished:

1. During geography lessons my teacher wants me to ... because ...
2. My teacher says we have geography lessons so that ...
3. Learning geography will ...
4. Geography helps you to ... because ...

Taylor found pupil responses to these statements to be a reliable guide to the way in which pupils perceive the objectives and values of their course.

Pupil Evaluation of Exercises and Activities

In order to obtain pupil evaluation of the various learning experiences a semantic differential test was used. The first five adjectival pairs were selected from those that Osgood, Suci and Tannenbaum (1957) have shown by factor analysis to be very reliable in accurately eliciting evaluative responses. The scales chosen after a pilot survey were:

Good - Bad
Successful - Unsucessful
Important - Unimportant
Pleasant - Unpleasant
Valuable - Worthless
Interesting - Boring

The scale 'Interesting-Boring' was not selected from Osgood's list but was included since it occurs frequently in pupils' comments and seems to be intuitively evaluative to pupils of this age.

Following Osgood's scheme, a semantic differential test was designed whereby the attitudes of pupils to twenty-four activities from the book designed for their age group and representing the nine major types of activity which could be discerned in the text book series as a whole, could be measured. The nine types of activity distinguished were:

A. studying theoretical plans or models;
B. reading and writing descriptions of problems facing other people

Thus, it is necessary to move from a consideration of desirable teaching competencies to an investigation of the social studies methods courses. It is the responsibility of these courses to provide the competencies with their emphasis on interdisciplinary reflective inquiry about current social issues and problems. This study solicits young teachers' perceptions of the design and delivery of their social studies methods courses as well as other information related to their preparation as teachers. These perceptions and this information are related to the teachers' definitional orientations. These relationships are examined for statistical significance and practical relevance to the modification and improvement of existing social studies methods courses in Pennsylvania.

The general focus of this study is supported by recent comments concerning research in social studies teacher education. Tucker (1977, p. 98) quotes Gage who said:

> "Research about social studies teacher education . . . can best be viewed as research in which teachers' behaviours and characteristics are dependent variables, and ways of recruiting, selecting, and educating teachers are independent variables. (Gage, 1972, p. 141)"

A more recent comment by Gage (1978) continues to support this view:

> "One . . . direction for research on teaching is worth mentioning. It takes the form of concern with what might be called the teacher's implicit theory of teaching . . . The theory takes the form of a hierarchically structured set of beliefs about the proper ends and means of teaching, the characteristics of students, the modes of learning, and the ways in which all of these interact to govern the teacher's behaviour at any given moment . . . (p. 80)"

Thus, the definitional orientation of a teacher is one of several teacher characteristics, and it is subject to variation according to the selection and education of teachers. A definitional orientation includes a teacher's theory of teaching or his/her educational rationale. The general focus of this study is within the framework of worthwhile research about social studies teacher education.

STATEMENT OF THE PROBLEM

Within this general focus the problem of the study may now be identified. It has been asserted that social studies teacher education has placed insufficient emphasis on defining social studies and providing an educational rationale for teaching it. As a result, apparent confusion concerning the definition and purpose of social studies is said to characterize the social studies teaching profession. The purpose of this study was to investigate these assertions for young secondary social studies teachers in Pennsylvania and to suggest implications for social studies teacher education in Pennsylvania. Thus the study proceeded to:

1. determine the variety of definitional orientations of young secondary social studies teachers in Pennsylvania;

2. examine what relationships may exist between a teacher's definitional orientation and a selected number of variables that impinge upon his/her preparation and early professional experience as a teacher; and

BACKGROUND TO THE STUDY

The general focus of the study is on the definitional orientations of young secondary social studies teachers in Pennsylvania as they relate to selected variables.

Recent studies (Morrissett, 1977; Gross, 1977) have indicated a variety of definitional orientations held by American secondary social studies teachers. Definitional orientation refers to the teacher's view of social studies as represented by his/her practices in the social studies classroom. The current professional literature suggests a definitional orientation towards reflective inquiry as most appropriate to the needs of our secondary school students. However, the above studies have found history and social science definitional orientations to be far more common among secondary social studies teachers. It seems no surprise, therefore, that secondary school students perceive social studies as the most irrelevant and least useful subject in the curriculum (Fernandez, Massey, and Dornbusch, 1976).

These trends come at a time when accountability in education is of paramount importance; when, in fact, social studies chairmen in some school districts have been asked to justify the inclusion of social studies in the curriculum; and when the current trend for 'back to the basics' could force social studies as a school subject out of existence.

Within this context, the social studies teaching profession has embarked upon a course of self-examination. The focus has been considerably upon the inadequacies of social studies methods courses in the colleges and universities (Corbin and Lowe, 1970; Tucker, 1972; Shaver, 1977a). Added to this is an apparent trend in recent years of the development of in-service programs by the professional organizations. The National Education Association's in-service program 'Models of Teaching' is a prime example. It could be conjectured that this trend could lead to the development of pre-service programs, and to the ultimate demise of social studies methods courses in colleges and universities.

Therefore, it is important for social studies methods instructors to offer courses that are responsive to the needs of teachers in preparation and teachers already in the profession. It must always be remembered that these young teachers must possess the competencies to teach their students how to cope in an increasingly complex, interdependent, and ever-changing world (Open University, 1971; Schwartz (editor), 1972). This study demonstrates how social studies methods instructors may draw from young teachers and from other sources, information that is useful in developing courses that facilitate the necessary competencies (Stufflebeam, 1971; Burton, 1977).

An appropriate starting point is a statement of teaching competencies for secondary social studies teachers. These competencies are generally established by committees whose membership includes practising teachers. An excellent example is the list of competencies for social studies teachers (7 - 12) in Pennsylvania (Craig (ed.), 1978: 38 - 44). Implicit in this list is the necessity for teachers to possess a philosophical basis or an educational rationale for teaching. However, the current literature (Shaver, 1977a; Gross, 1977) suggests that social studies methods courses have failed to provide a pervasive educational rationale for teaching social studies in secondary schools. Shaver (1977a) asserts that this has produced a state of mindlessness in the social studies teaching profession.

DEFINITIONAL ORIENTATIONS OF YOUNG SECONDARY SOCIAL STUDIES TEACHERS: SOME IMPLICATIONS FOR SOCIAL STUDIES TEACHER EDUCATION

by IAN MACPHERSON*

Abstract. *The purpose of the study reported in this paper was to investigate certain assertions about secondary social studies teacher education in the U.S.A. The study focussed on six research questions and suggested some implications for social studies teacher education. Among these is the usefulness of an instructional system design approach in the modification and improvement of courses in social studies teacher education. The usefullness of this approach is illustrated in Appendix B.*

The paper concludes by suggesting some further directions for research in social studies teacher education.

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preferably British - would seem to demonstrate a lamentable failure on our part to develop empathy for life-styles different to their own. In our attempts to encourage pupils to come to grips with problems at a global scale we would seem to have lost the human perspective.

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reading and writing about rural depopulation in Great Britain received more favourable scores than the other exercises in the group of which concerned the Third World.

It must be emphasized that such explanations are highly tentative since pupils were not, and in the nature of a semantic differential test, could not, be asked to explain their evaluation of individual exercises.

It would seem, however, from an analysis of all the individual exercise-activity responses that mapping exercises - both those involving large scale topographical and land use maps and atlas maps - and graph drawing are highly valued, while problem solving exercises, on which such emphasis is placed, both by the authors of the books and by conventional wisdom of current geography teaching, are seen as of less value. Perhaps this could be explained by suggesting that either pupils of this age are not yet sufficiently mature to feel involved in such large scale and apparently intractable problems or that the problems solving approach to geography teaching is suffering from 'overkill'. The skills of geography, on the other hand, which receive much emphasis in the authors' rationale and so little mention in the pupils' perceptions of the objectives of their course, appear to be highly valued.

An examination of reactions to all the exercises and activities, regardless of group, and the photographs, suggests that the pupils in the survey demonstrated four broad areas of preferences in the content and method of geographical exercises. They would seem to prefer:

1. description to quantification;
2. people to places or abstractions;
3. urban studies to rural studies;
4. British to Third World studies.

PERSONAL CONCLUSIONS

While it is reassuring to discover that our pupils feel that their geography course is worthwhile and expect it to engender a greater understanding of the world in which they live, it is salutary to find that they would perfer a more conservative teaching approach with more explanation. Perhaps data-based teaching methods should begin with textual materials well within the private reading ability of a greater proportion of our pupils.

The preference for topics to which they can relate personally - urban life, Individual use of the books by pupils would seem to be further inhibited by the inability of many pupils to appreciate the typographic conventions used in the books. That so many pupils had failed to appreciate the significance of the bold type may indicate a failure on the part of teachers to explain this convetion, but the failure of many pupils to discern the difference in type between explanatory text and instructions - especially after up to two years familiarity with the book - suggests that either the differences are too subtle for the visual perception of pupils of this age or that as teachers we are too sanguine about the ability of pupils to appreciate such conventions on their own. Perhaps these conventional aspects of book use should be taught as a specific skill.

In examining the pupils' evaluation of the exercises or activities in which they had partaken it is noteworthy that only one group of activities was recorded by pupils with a mean score of over 3 (3 is the neutral point between 'worthwhile' and 'not worthwhile'). Group G - mathematical methods of analysis - was evaluated as not worthwhile by third year pupils. In all other cases the distinctions made were between various activities all perceived as generally worthwhile.

Pupils in both year groups valued games and simulations. However, a major difference in opinion is revealed in regard to mathematical methods of analysis and to a lesser extent to exercises involving the suggesting of possible solutions to a problem. The traditional activities of geography lessons - extracting information from prose, graphs and diagrams, writing descriptions and drawing maps would all appear to be valued without arousing strong feelings.

Further light on the pupils' reactions, however, is shed by the scores recorded for individual exercises and activities. For example, as shown on Figure 7 the reaction to exercise A2 is significantly less favourable than that to the others in that group. This exercise refers to the drawing of graphs demonstrating bid-rent curves and city centre land use. As such it involves some elementary quantification whereas the other exercises - 'Anyport', 'Planning a polder' and 'Monoton' - may be seen by pupils as more descriptive and therefore preferable. Further examples may be found in the third year responses. Exercise A4 concerns the theoretical growth of a transport network in a developing country and received a markedly less favourable response than other theoretical exercises which may have appeared to be of greater relevance to mankind. Similarly, exercise B2, involving

Appreciation of Typographic Conventions

In answer to the direct question: 'Why do you think that this phrase (pointing to an example on a sample page) is printed in bold type - much blacker than the rest?' only 12 second year pupils and 7 third year pupils gave responses which suggested an awareness that bold type signifies important words or phrases which should be remembered. The rest apparently regarded it as signifying a sub-heading, even though in the middle of a sentence, or had never given the matter any thought. However, when asked to point out the different type faces present on a sample page, only 4 second year pupils, compared with 7 third year pupils, identified all the types.

DISCUSSION OF RESULTS

Application of Fry's method of calculating readability to the two volumes indicates that the book published for second year pupils (12-13 years) requires a reading age appropriate to ninth grade pupils in the U.S. (14-15 years) while the book for third year pupils (13-14 years) has a readability appropriate to eleventh grade pupils (16-17 years). This would suggest that, rather than be surprised that only 25% of second year pupils and 50% of third year pupils surveyed can read and understand the book intended for their age group, it would perhaps be more appropriate to take this as further evidence of the wide range of reading ability present in any class and to seek reasons for the apparent success of the course, the problem of readability notwithstanding.

The finding that about 50% of pupils consider that photographs are frequently used in class and almost all the rest record at least occasional use, together with the general satisfaction with their geography course by both year groups, may support a comment by Michael Marland (1977) that:

> "most teachers not directly concerned with giving a reading lesson have learned the trick of circumnavigating print, avoiding it whenever possible, paraphrasing at other times and only rarely finding ways of helping the pupils into and through the actual text."

Certainly one would never have expected from an examination of pupil exercise books or school examination scripts that the text on which the course was based could pose such problems of reading.

Impact of Photographs

Table 2 shows that a high proportion of pupils in both year groups found that specific photographs stuck in their memories.

TABLE 2: IMPACT OF PHOTOGRAPHS

		No of pupils	
		2nd Yr.	3rd Yr.
Pupils able to describe a specific photographs:	easily	15	19
	after thought	8	3
	not at all	1	2
		24	24
Pupils recording photographs as being referred to in class:	often	11	10
	occasionally	12	11
	never	1	3
		24	24
Pupils finding photographs:	useful and interesting	11	10
	occasionally useful and interesting	13	12
	never useful or interesting	0	2
		24	24

An analysis of the photographs most commonly described revealed that of the twenty-two third year pupils who described a photograph sufficiently well for it to be identified, fourteen chose photographs from the early part of the book dealing with Third World countries Six chose the photograph of a child with the swollen belly of malnutrition and legs deformed by rickets (Preface to Book III). Of the twenty-three second year pupils who described a specific photograph, two chose migrant workers on a German railway station (Fig 7.5a of Book II), five chose a photograph of a Parisian 'bidonville' in the 1960s (Fig 7.5b), two a 19th century courtyard in a British industrial city (Fig 3.10a) and four chose workers building a railway in northern Sweden at the turn of the century (Fig 8.4a). This perhaps indicates that the photographs of highest impact in the books are those that show people in apparently impoverished circumstances.

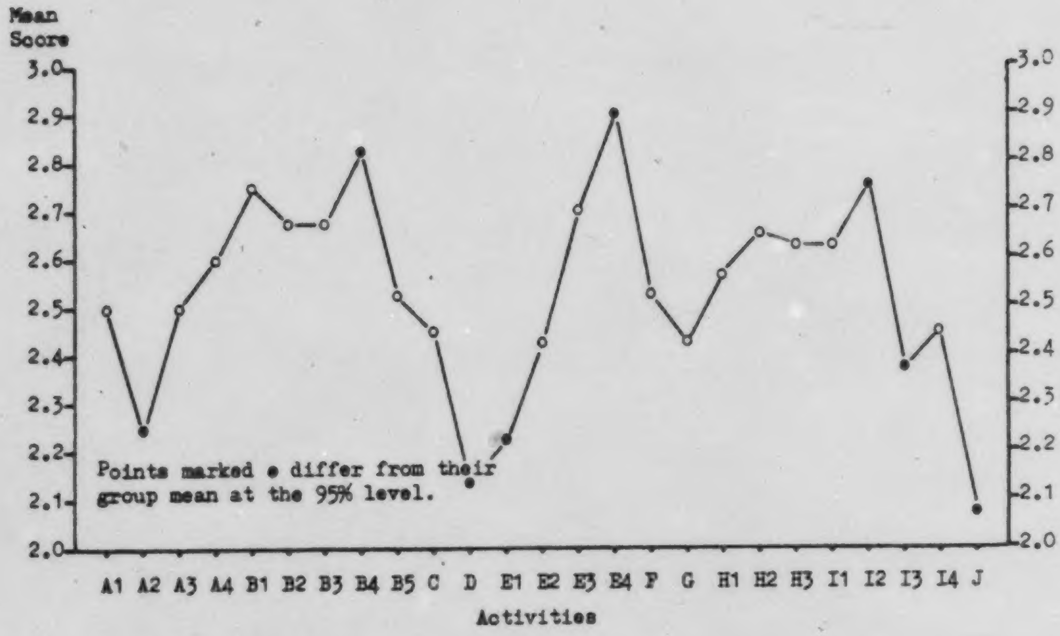


FIGURE 7: MEAN SCORE FOR INDIVIDUAL ACTIVITIES: 2ND YEAR STUDENTS

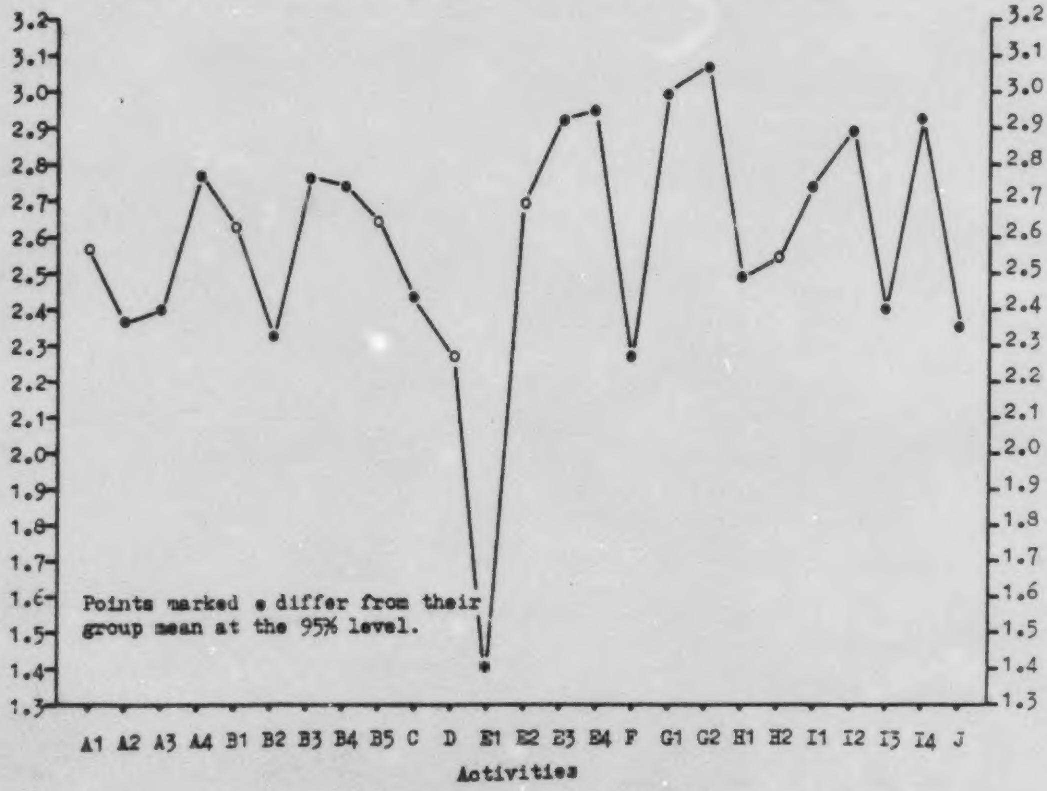
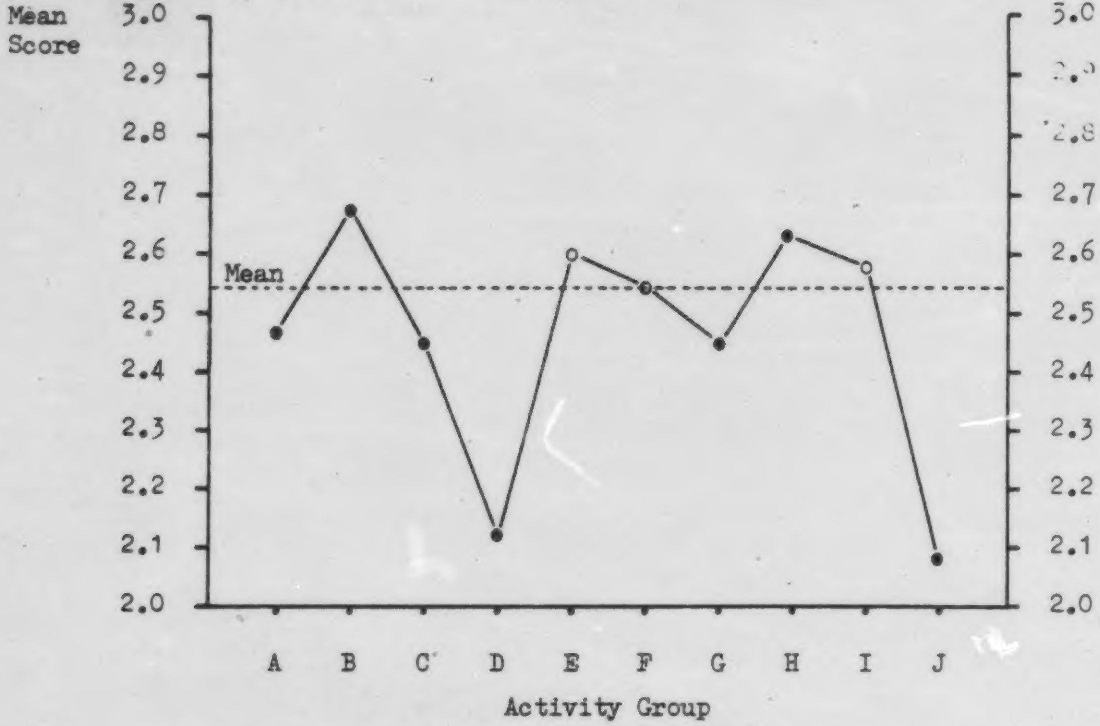


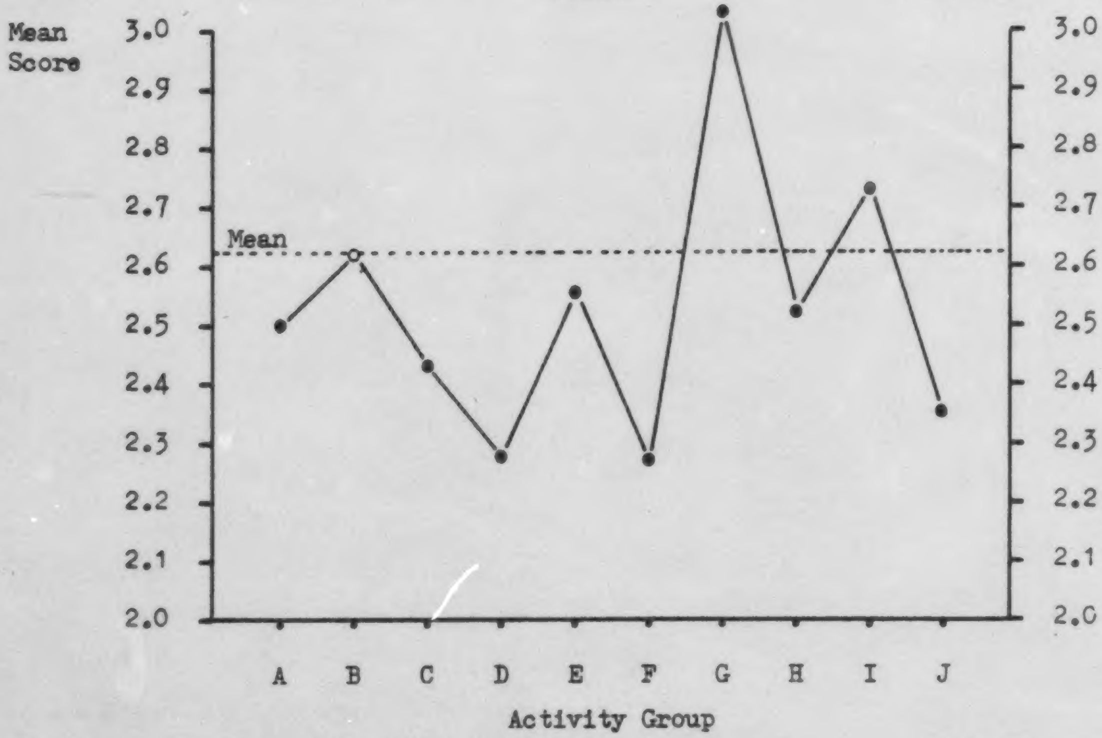
FIGURE 8: MEAN SCORE FOR INDIVIDUAL ACTIVITIES: 3RD YEAR STUDENTS

277 312



Points marked ● differ from the mean at the 95% level.

Figure 5: MEAN SCORES FOR EACH GROUP OF ACTIVITIES: 2nd YEAR STUDENTS



Points marked ● differ from the mean at the 95% level.

Figure 6: MEAN SCORES FOR EACH GROUP OF ACTIVITIES: 3rd YEAR STUDENTS

substantial minority (34% of second year and 40% of third year pupils) see the subject as contributing to their overall examination success.

Pupil Evaluation of the Learning Experiences Presented to Them

A five point scale was used in the semantic differential test and accordingly a score of 1 recorded a strongly positive attitude, 5 represented a strongly negative attitude and 3 represented a neutral reaction.

The mean response to the activities by second year pupils was 2.543 while their mean response to the final statement 'Your geography course this year' was 2.075. Similar mean scores (2.623 for the activities and 2.339 for the final statement) were recorded by third year pupils. This would suggest that the pupils regard their geography course as generally worthwhile.

Figures 5 and 6, however, reveal significant differences between the attitudes recorded to the various groups of activities for second and third year groups respectively. Second year pupils recorded less favourable scores for reading and writing descriptions of problems facing other people (Group B) and for drawing maps (Group H) while third year pupils recorded their least favourable scores for exercises involving mathematical methods of analysis (Group G) and requiring them to suggest solutions to problems facing other people (Group I).

Third year pupils recorded attitudes significantly more favourable than the average to six out of the nine exercise groups. The relatively high value of the overall mean in this case can be attributed to a large number of pupils recording unfavourable scores to mathematical methods of analysis (Group G) and activities involving pupils in suggesting their own solutions to a problem (Group I).

Figures 7 and 8 show the mean scores for each individual activity. It reveals that certain individual activities were perceived as having different value to others in the same group. Activities which received scores which differed from others in the group significantly at the 95% level are distinguished on the graphs. For second year pupils, exercises or activities A2, E1, E4, I2 and I3 were perceived as differing from their groups while for third year pupils individual exercises or activities were perceived as different from their groups in all the main groupings.

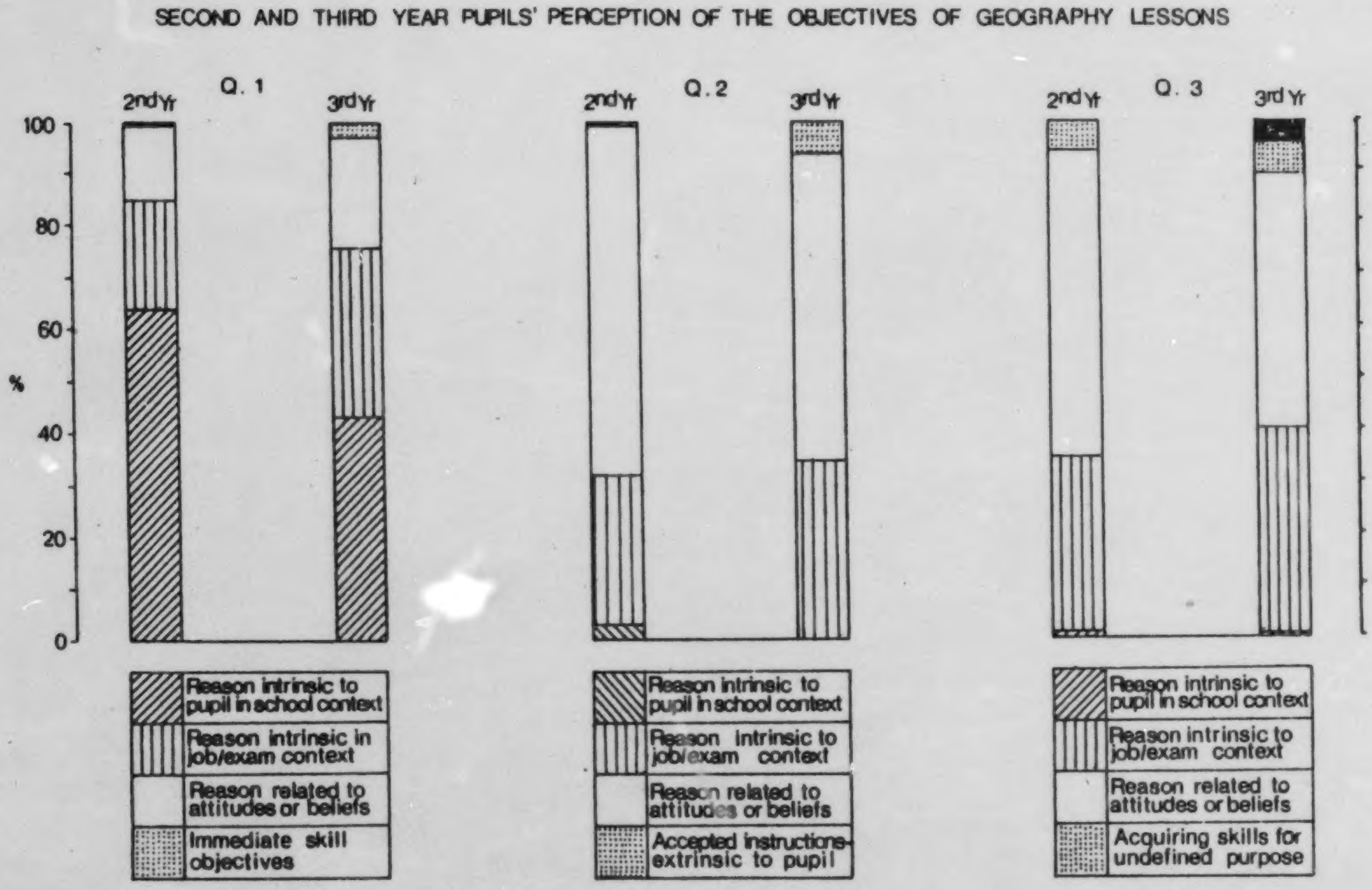


FIGURE 4: SECOND AND THIRD YEAR PUPILS' PERCEPTION OF THE OBJECTIVES OF GEOGRAPHY LESSONS.

Pupil Perception of Course Objectives

When writing about what their teachers want them to do in geography lessons, virtually all the pupils responded using the words 'work', 'read' or 'write'. Figure 4 shows that by far the most common group of responses referred to the traditional teacher-pupil relationship in which pupils are expected to do their 'work' in order to achieve approbation from the teacher in the form of 'good marks', a satisfactory result in school examinations, promotion to a more able teaching set or other mark of approval. However, when the two year groups were compared it transpired that while 64% of second year pupils placed their greatest emphasis on this justification for working, only 43% of third year pupils are thus motivated. The difference between the two figures is made up by the greater proportion of third year pupils who see their teachers' aims as having an influence on future job prospects and their understanding of, and attitude towards, world problems.

Pupils' perception of the reasons given by their teachers for the study of geography as revealed in their responses to Statement 2 ('My teacher says we have geography lessons so that ...') varied much less between the two groups. It would appear that all four teachers involved had placed their greatest emphasis, explicitly, on the importance of geography in developing an understanding of population problems, planning decisions, industrialization and the Third World.

The second most common reason for the study of geography recorded by pupils is also remarkably consistent between the two year groups. 29% of second year and 34.5% of third year pupils referred to examination or job aspirations as being offered by teachers as justification.

Statements 3 and 4 ('Learning geography will ...' and 'Geography helps you to ... because ... ') were perceived by many pupils as indistinguishable and so their responses to these two statements were analysed together. Both year groups agreed that the study of geography would make its greatest contribution in developing and guiding their attitudes to the problem facing mankind (59% of second year and 50% of third year pupils) while a

RESULTS OF THE STUDY

Readability, Comprehension and Understanding

The aggregate figures for the four stages of this part of the survey (first impressions of the book, free explanation of a passage, structured explanation and interpretation of activity instructions) are given in Table 1.

TABLE 1: AGGREGATE FIGURES OF PUPIL'S REACTION TO TEXT BOOKS

	First Impression			Free Explanation				Structured Explanation				Instruction Interpretation			
	Easy	Puzzling	Difficult	Well	Hesitantly	Partly	Unable to explain	Well	Hesitantly	Partly	Unable to explain	Well	Hesitantly	Partly	Unable to explain
2nd Yr.	11	11	2	4	4	7	9	4	6	6	8	4	5	9	6
3rd Yr.	18	6	0	9	3	10	2	10	4	6	4	4	6	2	6

(Six Third Year pupils had already completed the chosen activity)

Table 1 reveals that second year pupils usually over-rated their understanding and showed little improvement when given some guidance to their reading. A detailed analysis of the pattern of responses of individuals revealed that of the eleven (out of twenty-four) pupils who claimed that the passage was 'easy', only two could, in fact, summarize the passage with ease while a further four achieved an acceptable summary after considerable hesitation. Of the eleven pupils who had originally admitted to finding the passage 'puzzling', two proceeded to give accurate summaries while the remaining ten pupils failed to include the salient points and were not helped by the provision of a structure on which to base their summary. Of the rest, only five were aided by the provision of a structure.

Third year pupils were generally more able to cope with the language of the book. Of the eighteen who described the passage as easy, nine succeeded in giving a clear summary, three after some hesitation and only six failed to give a full summary. Of the fifteen pupils who had some difficulty in summarizing the passage, seven were aided by a structured question while the rest showed no improvement.

10) Analysing the place names on an O.S. map extract in order to work out which group of early settlers inhabited the area.

Boring ____:____:____:____:____ Interesting
Good ____:____:____:____:____ Bad
Unsuccessful ____:____:____:____:____ Successful
Valuable ____:____:____:____:____ Worthless
Unimportant ____:____:____:____:____ Important
Unpleasant ____:____:____:____:____ Pleasant

11) Studying graphs of the various prices land users would be prepared to pay for land at different distances from the town centre.

Valuable ____:____:____:____:____ Worthless
Unimportant ____:____:____:____:____ Important
Bad ____:____:____:____:____ Good
Pleasant ____:____:____:____:____ Unpleasant
Boring ____:____:____:____:____ Interesting
Successful ____:____:____:____:____ Unsuccessful

12) Finding out how many of the capital cities of Europe are more than twice the size of the second city in that country using an atlas and population tables.

Successful ____:____:____:____:____ Unsuccessful
Good ____:____:____:____:____ Bad
Important ____:____:____:____:____ Unimportant
Pleasant ____:____:____:____:____ Unpleasant
Boring ____:____:____:____:____ Interesting
Valuable ____:____:____:____:____ Worthless

13) Reading about and describing the reasons for urban growth in England from the Middle Ages to the present day.

Boring ____:____:____:____:____ Interesting
Successful ____:____:____:____:____ Unsuccessful
Worthless ____:____:____:____:____ Valuable
Unimportant ____:____:____:____:____ Important
Good ____:____:____:____:____ Bad
Unpleasant ____:____:____:____:____ Pleasant

14) Working out the number of French farms under 20 ha. and over 100 ha. from a table of figures.

Boring ____:____:____:____:____ Interesting
Successful ____:____:____:____:____ Unsuccessful
Worthless ____:____:____:____:____ Valuable
Unimportant ____:____:____:____:____ Important
Good ____:____:____:____:____ Bad
Unpleasant ____:____:____:____:____ Pleasant

15) 'Planning a Polder' exercise - a compromise between the farmer, his wife, the postman and the Scroogeland District Council.

Important ____:____:____:____:____ Unimportant
Good ____:____:____:____:____ Bad
Successful ____:____:____:____:____ Unsuccessful
Boring ____:____:____:____:____ Interesting
Valuable ____:____:____:____:____ Worthless
Unpleasant ____:____:____:____:____ Pleasant

FIGURE 3: EXTRACT FROM 2ND YEAR SEMANTIC DIFFERENTIAL TEST

Activity group no.	No. in Questr.	Brief description of activity content
A1	10	Developing a 'population cycle' to forecast possible Third World developments.
A2	14	Comparing the occupational structures of various countries.
A3	20	Drawing a 'vicious circle of poverty'.
A4	24	Drawing theoretical stages in the development of a transport network in a developing country.
B1	3	Reading about and describing 'Chitamene farming'.
B2	6	Discussing and writing about problems of rural depopulation.
B3	12	Reading about and describing Calcutta.
B4	16	Reading about and describing a Bombay rice farmer's year.
B5	19	Reading two alternative views on population growth and giving personal views.
C	9	Playing the 'Mail cattle dealers' game.
D	23	Role play - locating a new radio assembly plant in South America.
E1	8	Analysing land use patterns around Abergavenny.
E2	11	Comparing population density maps with population change maps to identify movements of population.
E3	13	Comparing an aerial photograph and a map of Fez.
E4	18	Analysing the climates of Kew and Bombay from graphs.
F	17	Graphing birth and death rates for England and Wales.
G1	5	Calculating Spearman's R.
G2	7	Calculating connectivity indices for transport networks in developing countries.
H1	15	Mapping the progress of urbanization in various countries.
H2	22	Mapping population density and population growth for the various countries of the world.
I1	1	Planning the layout of the new city of Ciuydad Guyana.
I2	2	Answering the question 'Was Malthus right?'.
I3	4	Suggesting possible solutions to rural depopulation.
I4	21	Designing a communications network for Zaire.
J	25	'Your geography course this year'.

Figure 2: THE ACTIVITIES IN THE THIRD YEAR QUESTIONNAIRE FOR THE SEMANTIC DIFFERENTIAL TEST

Activity group no.	No. in Questr.	Brief description of activity content
A1	1	'Anyport' - the way in which a typical port has grown - diagram after Bird.
A2	11	Studying graphs of the various prices land users would be prepared to pay for land at various distances from the town centre.
A3	15	'Planning a polder' exercise - various farm layouts.
A4	24	'Monoton' - land use around a town - diagram after Von Thunen.
B1	4	Reading about and describing the reclamation of Zuyder Zee.
B2	7	Reading about and describing planning problems in Randstad.
B3	13	Reading about and describing reasons for urban growth in England and Wales.
B4	17	Reading about and describing land reforms in Southern Italy.
B5	20	Reading about and describing the housing and traffic problems of Paris.
C	23	Playing 'The Monoculture Game' - demonstrating the influence of chance factors.
D	19	Taking part in the 'Evry New Town Auction' - whole class role play.
E1	9	Finding ut about the effects of street quality and house quality on death rates in 19th C. Manchester from table.
E2	10	Analyzing place names on a topographical map extract.
E3	12	Finding out the relative sizes of capitals and second cities of European countries from a table and atlas gazeteer.
E4	14	Working out the distribution of French farms by size and area from a table.
F	18	Drawing graphs of population growth of Randstad Holland.
G	8	Calculating the location quotient of industries for the regions of Italy.
H1	6	Weighting areas of Europe for relief, climate and proximity to coal fields before comparing such a map with one showing the distribution of population in Europe.
H2	16	Mapping port hinterlands in Europe.
H3	22	Mapping urban population density of European countries.
I1	2	Designing the land use pattern of a polder.
I2	3	Suggesting possible disadvantages of further growth in Randstad Holland.
13	5	Designing a housing policy for Paris.
14	21	Explaining preferences for living in the town or the country.
J	25	'Your geography course this year.'

Figure 1: THE ACTIVITIES IN THE SECOND YEAR QUESTIONNAIRE FOR THE SEMANTIC DIFFERENTIAL TEST

C. playing geographical games;
D. taking part in dramatic simulations;
E. finding out information from graphs, tables or maps;
F. drawing graphs;
G. using mathematical methods of describing features studied in geography;
H. drawing maps of the distributions of various features;
I. working out possible solutions to problems facing other people.

It was originally intended to present the broad descriptions of tasks as listed above to the pupils with examples of actual exercises quoted to aid their recognition. However, in the light of Osgood's suggestion that items presented for consideration should 1) be familiar to all the subjects since unfamiliar items for some subjects will produce a spurious regression towards the middle of the scales, and 2) have a single unitary meaning for the individual since otherwise the subject may vacillate in what is being judged, this was thought to be inadvisable. It was therefore decided to select specific exercises representing variations within the types listed. This yielded twenty-four activities for each year group to which was added a final statement - 'Your geography course this year'. Figure 1 shows the exercise and activities selected from Book II for second year pupils. Figure 2 shows those selected from Book III for third year pupils.

This was considered a very important part of the evaluation because these activities embody both the content, depth of coverage and learning experiences employed in the text books and in the course. The semantic differential scales were applied to each of the twenty-four activities and the statement about the whole course. An extract from the semantic differential questionnaire given to second year pupils is given as Figure 3.

3. suggest implications for social studies teacher education in Pennsylvania.

The variables selected for inclusion in this study are:

1. the diversity of undergraduate social science background;
2. the design characteristics of actual and ideal secondary social studies methods courses;
3. the delivery characteristics of actual and ideal secondary social studies methods courses;
4. the design and delivery characteristics of actual and ideal in-service education courses and/or workshops for secondary social studies teachers; and
5. the definitional orientation of peer social studies teachers.

These variables formed the basis for the last five research questions posed in this study.

All research questions were considered generally for the whole sample of teachers used in the study. There was also an exploration of patterns as they relate to such demographic variables as sex, years of teaching experience, tenure, type of school district, major teaching assignment, type of college attended for methods course, and professional organization affiliations. These patterns are not reported in this paper.

The study was basically concerned with what variables relate most to the three definitional orientations (history, social science, and reflective inquiry), and especially towards reflective inquiry. The reason for this was that the current literature advocates a definitional orientation towards reflective inquiry. One would expect, therefore, that a definitional orientation towards reflective inquiry would relate more strongly with the first, second, and fourth variables listed above; and less strongly with variables three and five than definitional orientations towards history and/or social science.

DEFINITION OF TERMS

Several terms are used frequently reporting the study, and it is appropriate to define them.

1. Definitional Orientation refers to the teacher's view of social studies as represented by his/her practices in the social studies classroom. Three definitional orientations are generally identified. They are history as the major focus of study (emphasis on a sound knowledge of the past as a guide to good citizenship); using the content and structure of a/the social science(s) (emphasis on the concepts, generalizations, and modes of inquiry of the social sciences); and reflective inquiry or critical thinking and examination of both facts and values in relation to social problems and issues (reflective inquiry does not necessarily deny the importance of history and/or social science orientation(s) and uses either or both of them whenever appropriate).

2. Diversity of Undergraduate Social Science Background involves a categorization of the teacher's undergraduate studies in the social sciences on the basis of diversity.

3. Actual Secondary Social Studies Methods Course is the course completed at the college level in social studies teacher education (pre-service) by the teacher responding to the questionnaire.

4. Ideal Secondary Social Studies Methods Course is the course that the teacher responding to the questionnaire would desire as his/her ideal of a pre-service social studies methods course.

5. In-Service Social Studies Course and/or Workshop for Secondary Social Studies Teachers is a course taken by the teacher since graduating as a teacher.

6. Peer Social Studies Teachers are those teachers who teach social studies in the same school as the teacher responding to the questionnaire.

7. Instructional System Design is a framework encompassing all essential elements that are operating on the learner around which the instructor designs learning activities to direct the learner to appropriate learning outcomes. A methods course should be developed systematically in this way so that students achieve the competencies they will need as beginning teachers.

8. Systems Characteristics are those qualities of an instructional system design which contribute to its sense of wholeness and cohesion. They include diagnosis (the identification of student needs); prescription (the providing of activities appropriate to diagnosed needs); sequence (the logical arrangement of activities); articulation (the demonstrated relationships among activities); transfer (facilitation in using one set of learning outcomes in a new set of activities); and feedback (the monitoring of instruction to maximize student performance and quality of strategies and materials employed).

9. Social Studies Methods Instructor is the person responsible for designing, delivering (or implementing), and evaluating a social studies methods course at the college level.

10. Definitional Components are those concerns which emphasize the development of an educational rationale for teaching social studies.

11. Practical Components are those concerns which emphasize instructional strategies to be employed in the teaching of social studies.

RESEARCH QUESTIONS

The following research questions were investigated:

1. What preferences in definitional orientation do young secondary social studies teachers in Pennsylvania have?

2. What relationship exists between definitional orientation and the diversity of undergraduate social science background?

3. What relationship exists between definitional orientation and the design of actual and ideal secondary social studies methods courses?

4. What relationship exists between definitional orientation and the delivery of actual and ideal secondary social studies methods courses?

5. What relationship exists between definitional orientation and the character of actual and ideal in-service education courses for secondary social studies students?

6. What relationship exists between definitional orientation and the definitional orientation of peer social studies teachers?

Each question was investigated for the entire sample of teachers used in the study. For the purposes of statistical analysis, a series of eighteen hypotheses was developed for the six research questions. (Appendix A)

RATIONALE FOR RESEARCH QUESTIONS

Research Question One. Three definitional orientations were chosen for consideration. This choice was based on Morrissett's (1977) study in which he found three dominant approaches to the teaching of social studies in America - history, social science, and critical thinking or reflective inquiry in that order. It was necessary for the study to begin by establishing the preferences in definitional orientation which young secondary social studies teachers in Pennsylvania display.

It should be noted that the study confined itself to secondary social studies teachers with five years of teaching experience or less. The study was confined to secondary teachers because findings by Gross (1977) suggest a much more confused pattern in secondary schools than in elementary schools concerning the definition and purpose of social studies. A similar pattern was found with pre-service students at The Pennsylvania State University (Macpherson, 1978). Teachers with limited experience were chosen to ensure a representation of those teachers who have taken a social studies methods course based on the 'new' social studies and to increase the likelihood of accurate recall of information pertaining to the methods course taken. A similar procedure was followed by Hare (1974). Burton (1977) strongly recommends young teachers as an excellent source of information upon which to base course modification and improvement.

Research Question Two. National Guidelines (National Council for Social Studies 1971 6:847-852) as well as state guidelines (Duncan, Rhodes, and Wisor (eds.) 1974:47; Craig (ed.) 1978:38-44) stress that secondary social studies teachers should have a diverse social science background as a basis for teaching social studies. However, this does not seem to be the case. Shaver (1977a) suggests that students generally have a very specialized social science background, and that their specialized area is usually their definitional orientation in social studies. A history major, for example, tends to have a definitional orientation towards history.

Research Question Three. Shaver (1977a) contends that social studies methods courses have placed too much emphasis on practical topics or components without too much concern for the philosophical/theoretical foundations underlying their use. Hare (1974), for example, found an emphasis on practical components in his study of secondary social studies teachers in south-eastern Pennsylvania. It was appropriate to explore this further in relation to definitional orientation towards reflective inquiry and an emphasis of definitional components in th actual methods course as well as the teacher's ideal of a methods course.

Research Question Four. Studies by Hare (1974) and Heller (1974) have shown an emphasis in social studies methods courses on practical components, while Masemore (1973) concluded that these practical components were not being presented by instructors in a manner consistent with the 'new' social studies. It would appear that social studies methods instructors are not practising what they are preaching (Kossack and Smith, 1976). An outcome of this is evidenced in Collins' (1975) conclusion that 'Americal Cultures' is being adopted in Pennsylvania's high schools, but that the primary mode of presentation is lecture-demonstration. Thus, this question investigated whether there is a relationship between a teacher's definitional orientation and the delivery characteristics of the methods instructor. The relationship is examined for actual and ideal methods courses.

Research Question Five. Studies by Barron and Bloomer (1975) and Macpherson (1977) suggest that teachers are increasingly asking for the inclusion of definitional components in in-service programs. This question sought to discover any relationship that may exist between a definitional orientation towards reflective inquiry and an emphasis on a cohesive treatment of definitional and practical components in in-service courses, both actual and ideal.

Research Question Six. Marsh (1976) has inferred that something occurs in the early years of teaching to destroy what the young teacher has learnt in his/her college or university course. Fuller and Bown (1975) support this view by suggesting that young teachers are assimilated quickly into the peer group. This research question probed this relationship in terms of definitional orientation.

METHODOLOGY

A stratified random sample of young secondary social studies teachers in Pennsylvania was drawn. Teachers in this sample were mailed a questionnaire. One hundred and seventy-three teachers (52.4 percent of the 330 teachers who were mailed questionnaires) completed and returned questionnaires. The information contained in the questionnaires provided the basis for the statistical analysis of the six research questions and related hypotheses. The statistical analysis utilized computer programs related to analysis of variance with repeated measures, and correlational analysis from the program library of the Computation Center at The Pennsylvania State University. Appropriate tables for statistical significance and the 'z' test for differences between correlations were used in the testing of the hypotheses.

FINDINGS

The findings are summarized as follows for each research question:

1. History is the most preferred definitional orientation among young secondary social studies teachers in Pennsylvania with reflective inquiry and social science second-most and third-most preferred respectively (Hypothesis One was rejected).

2. There is no relationship between definitional orientation and diversity of undergraduate social science background; there is no significant difference in the relationships of any of the three definitional orientations and diversity of undergraduate social science background; and all teachers sampled in the study have a reasonably diverse undergraduate social science background (Hypotheses Two and Three were retained).

3. There is a significant positive relationship between all three definitional orientations and emphasis placed on definitional components in (a) actual and (b) ideal secondary social studies methods courses, with no one definitional orientation bearing a significantly stronger relationship with emphasis on definitional components in both actual and ideal courses than the other two definitional orientations (Hypothesis Four was rejected, and Hypothesis Five was retained).

4. There is a significant positive relationship between all three definitional orientations and emphasis placed on practical components in (a) actual (excepting history) and (b) ideal secondary social studies methods courses, with no one definitional orientation bearing a significantly stronger relationship with emphasis on practical components in both actual and ideal secondary social studies methods courses than the other two definitional orientations (Hypothesis Six was rejected excepting for history and actual courses, and Hypothesis Seven was retained). There is a significant positive relationship between all three definitional orientations and emphasis placed on coherence between definitional and practical components in (a) actual (excepting reflective inquiry) and (b) ideal secondary social studies methods courses, with no one definitional orientation bearing a significantly stronger relationship with emphasis on coherence in both actual and ideal courses than the other two definitional orientations (Hypothesis Eight was rejected, excepting for reflective inquiry and actual courses, and Hypothesis Nine was retained).

5. There is no significant relationship between definitional orientation and emphasis placed on coherence between definitional and practical components in actual in-service education courses for secondary social studies teachers, but there is a significantly positive relationship for ideal courses, with no one definitional orientation bearing a significantly stronger relationship than the other two definitional orientations (Hypothesis Ten was retained for actual courses and rejected for ideal courses, while Hypothesis Eleven was retained).

6. There is no significant relationship between definitional orientation and the definitional orientation of peer social studies teachers, and there is no significance in the relationships of any of the three definitional orientations and definitional orientation of peer social studies teachers (Hypotheses Twelve and Thirteen were retained).

For the third, fourth, and fifth research questions additional hypotheses were tested. The findings are sumamrized as follows for each of these three research questions:

3. All teachers sampled in the study had a satisfactory emphasis on definitional components in actual secondary social studies methods courses, but they would like a significantly greater emphasis on definitional components in ideal secondary social studies methods courses (Hypothesis Fourteen was rejected).

4. All teachers sampled in the study had a satisfactory emphasis on practical components in actual secondary social studies methods courses, but they would like a significantly greater emphasis on practical components in ideal secondary social studies methods courses (Hypothesis Fifteen was rejected). All teachers sampled in the study placed greater emphasis on practical components than on definitional components in both actual and ideal secondary social studies methods courses (Hypothesis Sixteen was rejected). All teachers sampled in the study had a satisfactory emphasis on coherence between definitional and practical components in actual secondary social studies courses, but they would like a significantly greater emphasis on coherence in ideal secondary social studies methods courses (Hypothesis Seventeen was rejected).

5. All teachers sampled in the study indicated an unsatisfactory emphasis on coherence between definitional and practical components in actual in-service education courses for secondary social studies teachers, but they would like a significantly greater emphasis on coherence in ideal in-service education courses for secondary social studies teachers (Hypothesis Eighteen was rejected).

DISCUSSION BASED ON RESEARCH QUESTIONS

Research Question One. While it was concluded that the mean scores for all three subscales (representing the three definitional orientations in social studies) are significantly different from one another, it must be remembered that all mean scores are above 40 out of a possible score of 60, and that the correlations among the three subscales are approximately .5. However, an examination of confidence interval limits suggests that the difference between subscale I (history) and subscale II (social science) is of very small practical importance.

It may be assumed that young secondary social studies teachers in Pennsylvania have no dominant trend towards any one definitional orientation over the other two. It seems they see an almost equal value of history and reflective inquiry orientations and a lesser value on a social science orientation. However, all three definitional orientations have value for young secondary social studies teachers in Pennsylvania.

Thus, this study expands on Morrissett's (1977) nation-wide findings. Even though the teachers sampled in this study would possibly have ranked history as their most preferred definitional orientation in teaching social studies in a study such as Morrissett's, such a ranking does not show the relative strength of this preference over the other two. This study reveals the strength of this preference over the other two definitional orientations. This study also shows that young secondary social studies teachers in Pennsylvania are using all three definitional orientations, and that a ranking system fails to give a complete picture. Morrissett's conclusion concerning the dominance of history in the teaching of social studies in America might well be modified if the design of this study were used. One cannot conclude that a preference for history is dominant over the other two definitional orientations, at least for the teachers sampled in this study.

In a public school system where the secondary social studies curriculum is in a state of transition from an emphasis on history and social science to one on American and World cultures, the almost equal emphasis on history and reflective inquiry definitional orientations by teachers sampled in this study is encouraging.

The pattern of definitional orientations for all teachers sampled in this study does not necessarily indicate a confusion about the definition and purpose of secondary social studies as Shaver (1977a) suggests exists in the social studies teaching profession.

The highest score for history is understandable in a situation where the social studies curriculum has traditionally been based on history. However, it is of interest to note that while first-year teachers have higher mean scores for all three definitional orientations than second-, third-, fourth-, and fifth-year teachers, the highest of these is for reflective inquiry. This could well mean that new teachers have a commitment towards reflective inquiry in teaching social studies; but as they proceed with their career, they find curriculum requirements in schools restrictive to the further development and implementation of this definitional orientation. Several teachers in their general comments in the qeustionnaire indicated this to be the case. While this pattern is not sufficiently strong to be of statistical signficance, it merits closer attention.

Research Question Two. No relationship was detected between any of the three definitional orientations and diversity of undergraduate social science background. However, it was discovered from a closer examination of the teachers' undergraduate social science background that all teachers sampled in this study have a reasonably diverse undergraduate social science background, despite the dominance of history as a major subject. Therefore, it is suggested that these young teachers have taken secondary social studies methods courses which use the guidelines and standards for social studies teacher education (NCSS, 1971(b)) as they relate to a diverse undergraduate social science background.

Even though the teachers sampled in this study indicated a strong tendency to major in history, their diversity in lower-level courses in most, if not all of the social sciences, may well contribute to the very weak dominance of a definitional orientation towards history over the other two definitional orientations. Shaver's (1977a) assertion concerning the way young teachers define social studies in terms of their undergraduate major cannot be accepted with any degree of certainty for young secondary social studies teachers in Pennsylvania.

Research Question Three. All teachers, whatever their preferences in definitional orientation, confirmed the importance of definitional components in secondary social studies methods courses. While a satisfactory emphasis has been placed on definitional components in actual courses, all teachers sampled in this study would like a significantly greater emphasis on definitional components in ideal courses. Shaver's (1977a) assertion that methods courses have placed too little emphasis on definitional components is not supported by the perceptions which young secondary social studies teachers in Pennsylvania have of both their actual and ideal secondary social studies methods courses.

Research Question Four. All teachers, whatever their definitional orientation, also placed emphasis on practical components in methods courses. Once again, while a satisfactory emphasis has been placed on practical components in actual courses, all teachers sampled in this study would like a significantly greater emphasis on practical components in ideal courses. For both actual and ideal secondary social studies methods courses, significantly greater emphasis was placed on practical components than on definitional components. This is similar to Hare's (1974) findings that teachers favour practical components, and would seemingly support Shaver's (1977a) assertion mentioned above. However, this needs to be seen within the context of coherence between definitional and practical components. A strong desire for a link between theory and practice was expressed by most teachers in their general comments in the questionnaire. This desire is reflected in the emphasis they would place on coherence in an ideal secondary social studies methods course. Therefore, the greater emphasis on practical components within this context does not deny the importance of definitional components.

Research Question Five. Actual in-service education courses for secondary social studies teachers are perceived to be lacking in coherence by all teachers sampled in this study, whatever their preferences in definitional orientation. However, all teachers firmly supported the notion of coherence in ideal in-service education courses for secondary social studies teachers. Young secondary social studies teachers in Pennsylvania support the findings of Barron and Bloomer (1975) and Macpherson (1977) that teachers are increasingly requiring an emphasis on a theoretical rationale as a basis for instructional practices. While all teachers supported the notion of coherence for ideal in-service education courses for secondary social studies teachers, the strength of support was not as great as in ideal secondary social studies methods courses. This suggests that young secondary social studies teachers in Pennsylvania require more in their ideal in-service education courses than this study has revealed.

Research Question Six. No relationship was found for the entire sample of teachers in this study between definitional orientation and definitional orientation of peer social studies teachers. It is conjectured that the influence of peers is not as great as Fuller and Bown (1975) suggest, and that any changes that occur in teachers (Marsh, 1976) might relate more to curriculum requirements in schools than to the definitional orientation of peers. Stronger conclusions to this question could be reached if demographic data about the peers were available.

IMPLICATIONS FOR SOCIAL STUDIES TEACHER EDUCATION

Research Question One. Social studies methods instructors in Pennsylvania should see the continued need to stress all three definitional orientations in their methods courses. The results of this study suggest that young secondary social studies teachers in Pennsylvania have a variety of definitional orientations in their teaching. History is the major focus with lesser emphases on reflective inquiry and social science respectively. This variety is not viewed as confusion or mindlessness, but an attempt by these teachers to grapple with a school situation where social studies curricula are in a state of transition from the more traditional history and social science approaches to the interdisciplinary cultures approach. It would be unreasonable to expect these teachers to display a dominant definitional orientation towards reflective inquiry in such a situation.

As this transition continues, social studies methods instructors would be encouraged to increase their emphasis on definitional components in pre-service secondary social studies methods courses. Definitional components should include an increasing emphasis on social studies as an integration of experience and knowledge concerning human relations for the purposes of citizenship education. This emphasis should highlight a process of reflective inquiry which uses the concepts and methods of investigation of history and the social sciences. Such an emphasis is consistent wiht national and state guidelines and with the most recent statement of competencies for secondary social studies teachers.

Social studies teachers should be competent in initiating and developing their own curricula in social studies Such competence may help teachers to implement a definitional orientation towards reflective inquiry in their classrooms. Thus, social studies methods instructors should provide a basis for curriculum development in pre-service courses and build upon this basis in in-service courses. This should assist teachers in coping more effectively with the transition from the more traditional history and social science approaches to the interdisciplinary cultures approach.

Research Question Two. Teachers in this study have had a reasonably diverse undergraduate social science background. While no relationship was established between any definitional orientation and diversity, social studies methods instructors would do well to encourage diversity in all subjects at least in the lower levels. This is consistent with the national and state guidelines and will contribute a foundation to defining social studies as a process of reflective inquiry which uses the concepts and methods of investigation of history and the social sciences.

Research Questions Three, Four, and Five. Social studies methods instructors should consider the instructional system design approach as a viable means of meeting all teachers' needs regarding ideal courses at both the pre-service and in-service levels Greater emphasis is needed on definitional and practical components as well as on a coherence between both sets of components for pre-service and in-service courses. The possibilities of individualizing instruction in an instructional system design approach should not be overlooked. Such possibilities could cater to the specific needs of individual teachers, thus contributing to the value and meaning of these courses for all teachers.

Research Question Six. The fact that peers seem to have little influence on the teachers' definitional orientations should encourage social studies methods instructors to stress definitional components in pre-service and in-service courses. Instructors may well consider the possibility of becoming even more active with school personnel (administrators, curriculum co-ordinators, department chairmen, and classroom teachers) and with professional organization personnel in diffusing a definitional orientation towards reflective inquiry in the teaching of social studies in Pennsylvania's high schools. Such activity will help to reinforce instructors' efforts in pre-service courses and to mitigate likely forces in the schools against young teachers' maintenance of a definitional orientation towards reflective inquiry.

GENERAL CONCLUSION

Young secondary social studies teachers in Pennsylvania have a variety of definitional orientations, but all three orientations are considered important in their teaching. This variety is not interpreted as confusion, but as a means of handling a situation that as yet does not fully allow for a definitional orientation towards reflective inquiry which is advocated in the current professional literature and in national and state guidelines for curriculum development and teacher education.

These young teachers have had a reasonably diverse undergraduate social science background. All teachers confirmed that actual secondary social studies methods courses have attempted to comply with national and state guidelines, and that these courses have not stressed practical components at the expense of definitional components. The usefulness of the instructional system design approach in the modification and improvement of existing courses at both pre-service and in-service levels was soundly supported by all teachers.

Therefore, the findings in this study related to young secondary social studies teachers in Pennsylvania do not support the assertions about social studies teachers and social studies teacher education. These assertions concern an insufficient emphasis on defining social studies and providing an educational rationale for teaching it, and an apparent confusion concerning the definition and purpose among members of the social studies teaching profession. Social studies methods instructors in Pennsylvania have provided satisfactory methods courses, but should seriously consider the use of the instructional system design approach in their course revisions. (See Appendix B.)

SOME FURTHER DIRECTIONS FOR RESEARCH IN SOCIAL STUDIES TEACHER EDUCATION

The links between definitional and practical components in social studies teacher education could well be forged (or broken) by the directions our future efforts in research take. It is stongly suggested that firstly, research efforts must be strongly focussed on replication so that research findings may be generalisable to a much larger population than that of a single study such as the one presented in this paper. Secondly, research efforts must be directed to illuminating what actually takes place in educational settings so that decision making in educational efforts might be better faciliatated. Thirdly, research results should be disseminated and influence educational practice. It is sincerely hoped that the birth of the Australian Geographical Education Research Association will precipitate these further directions. It is suggested that if these directions are not taken , we will perpetuate the mindlessness to which Shaver (1977) alluded, and we will not provide in teacher education the sorts of experiences that will assist teachers to meet the challenges of the eighties and beyond.

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APPENDIX A

HYPOTHESES FOR RESEARCH QUESTIONS

To facilitate the statistical analysis, hypotheses for each research question were formulated. These hypotheses were stated as follows:

Research Question One. Young secondary social studies teachers in Pennsylvania show no greater preference for any one definitional orientation than for the other two definitional orientations (Hypothesis One).

Research Question Two. There is no relationship between definitional orientation and the diversity of undergraduate social science background (Hypothesis 2). No one definitional orientation bears a stronger relationship to diversity of undergraduate social science background than the other two definitional orientations (Hypothesis Three).

Research Question Three. There is no relationship between definitional orientation and emphasis placed on definitional components in (a) actual and (b) ideal secondary social studies methods courses (Hypothesis Four). No one definitional orientation bears a stronger relationship to emphasis placed on definitional components in (a) actual and (b) ideal secondary social studies methods courses than the other two definitional orientations (Hypothesis Five).

Research Question Four. There is no relationship between definitional orientation and emphasis placed on practical components in (a) actual and (b) ideal secondary social studies methods courses (Hypothesis Six). No one definitional orientation bears a stronger relationship to emphasis placed on practical components in (a) actual and (b) ideal secondary social studies methods courses than the other two definitional orientations (Hypothesis Seven). There is no relationship between definitional orientation and emphasis placed on coherence between definitional and practical components in (a) actual and (b) ideal social studies methods courses (Hypothesis Eight). No one definitional orientation bears a stronger relationship to emphasis on coherence between definitional and practical components in (a) actual and (b) ideal secondary social studies methods courses than the other two definitional orientations (Hypothesis Nine).

Research Question Five. There is no relationship between definitional orientation and the emphasis placed on coherence between definitional and practical components in (a) actual and (b) ideal in-service education courses for secondary social studies teachers (Hypothesis Ten). No one definitional orientation bears a stronger relationship to coherence between definitional and practical components in (a) actual and (b) ideal in-service education courses for secondary social studies teachers than the other two definitional orientations (Hypothesis Eleven).

Research Question Six. There is no relationship between the definitional orientation of secondary social studies teachers and the definitional orientation of peer social studies teachers (Hypothesis Twelve). No one definitional orientation bears a stronger relationship to the definitional orientation of peer social studies teachers than the other two definitional orientations (Hypothesis Thirteen).

Related to the third, fourth, and fifth research questions, the following hypotheses were tested for the entire sample of teachers used in this study: There is no difference in the emphasis placed on definitional components in (a) actual and (b) ideal secondary social studies methods courses (Hypothesis Fourteen). There is no difference in the emphasis placed on practical components in (a) actual and (b) ideal secondary social studies methods courses (Hypothesis Fifteen). There is no difference in the emphasis placed on definitional and practical components in (a) actual and (b) ideal secondary social studies methods courses (Hypothesis Sixteen). There in no difference in the emphasis placed on coherence between definitional and practical components in (a) actual and (b) ideal secondary social studies methods (Hypothesis Seventeen). There is no difference placed on coherence between definitional and practical components in (a) actual and (b) ideal in-service education courses for secondary social studies teachers (Hypothesis Eighteen).

APPENDIX B

THE USE OF THE INSTRUCTIONAL SYSTEM DESIGN APPROACH: AN AUSTRALIAN EXAMPLE

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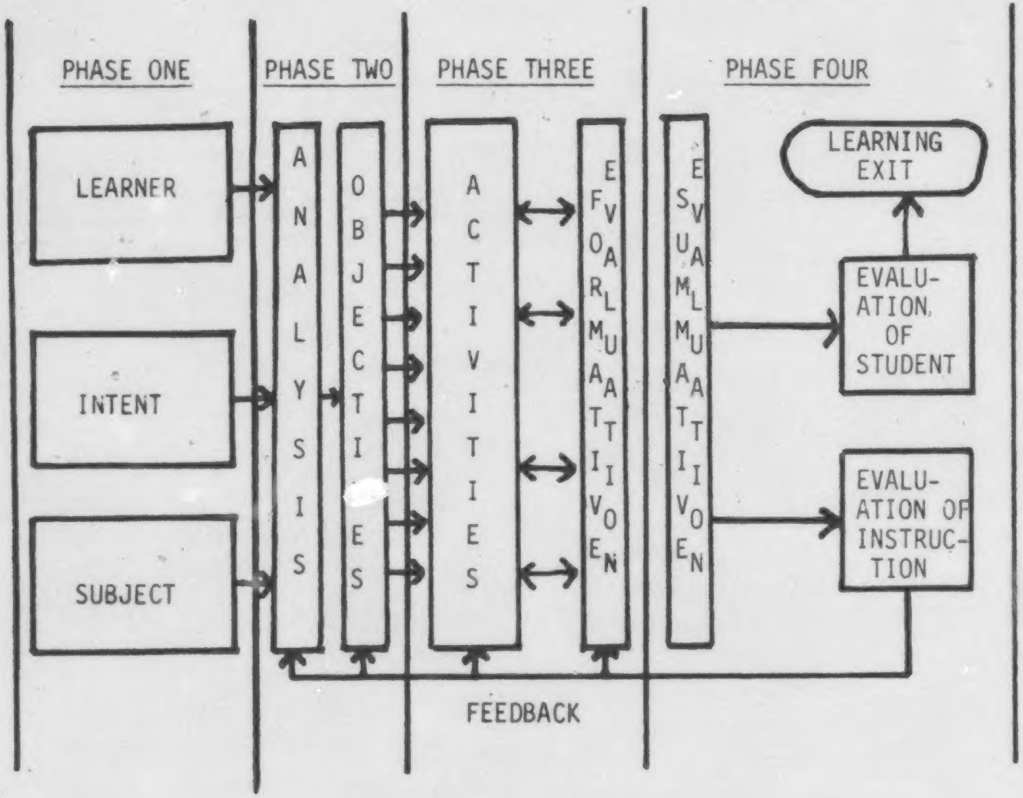
An instructional system design approach has been defined by Searles (1977) as:

> "a framework encompassing all the elements that are operating on the learner around which the teacher designs learning activities to direct the learner to appropriate learning outcomes."

Emphasis is placed on continual formative evaluation so that the instructional system design approach is not a rigidly linear model of curriculum development, but a more flexible process model able to respond to changing needs as a program is implemented. An instructional system design approach is shown in figure 1.

FIGURE 1 : AN INSTRUCTIONAL SYSTEM DESIGN APPROACH (after Searles, 1977)


PHASE ONE
PHASE TWO
PHASE THREE
PHASE FOUR
LEARNER
INTENT
SUBJECT
ANALYSIS
OBJECTIVES
ACTIVITIES
FORMATIVE EVALUATION
SUMMATIVE EVALUATION
LEARNING EXIT
EVALUATION OF STUDENT
EVALUATION OF INSTRUCTION
FEEDBACK

This approach has been adopted at Kelvin Grove College of Advanced Education and used as the basis for planning a three semester integrated program for Social Studies Pre-Service Teacher Education, (Pow, Doube, Macpherson 1979). The adaptation is shown diagrammatically in Figure 2.

The rationale for the three-semester integrated social studies program was developed from three major inputs. These include the expectations of the beginning primary teacher (as envisaged by the college committee responsible for developing the new unit-based course structure for primary studnets); the feedback from former students concerning the former social studies methods course; and the content and structure of the Queensland social studies curriculum within the broader context of Social Studies Education.

The rationale provided the basis upon which four general objectives were identified. The new three-semester integrated social studies program should allow the beginning teacher -

1. to define (and be familiar with) the context/social science base of social studies curricula;
2. to define and justify the role of social studies in the primary school curriculum;
3. to organise the Queensland social studies curriculum for instructional purposes (with emphasis on -
    - (i) the selective use of contributing social sciences;
    - (ii) the psychological development of children;
    - (iii) the sociological/economic/geographical setting of children;
    - (iv) the application of innovative ideas from other curricula);
4. to employ a basic repertoire of professional/instructional skills and strategies.

Four areas of competence were developed from these objectives. These areas (content, theory, psychology, and curriculum and instruction) are described in detail in Table 1.

The table presents the suggested sequence of the three semester units in social studies. Students should develop competence in all blocks in order to realize the objectives stated above. Thus the table is being used as the basis of lecturer planning within each of the three units. A team of lecturers is responsible for implementing the units. At present, the first of the three units is being implemented.

The instructional system design approach has been most useful, at least in the planning stage, in linking definitional components with practical components.

This example serves to illustrate:

(i) the usefulness of the instructional system design approach, and

(ii) the practical application of one of the implications of the study reported in this paper.

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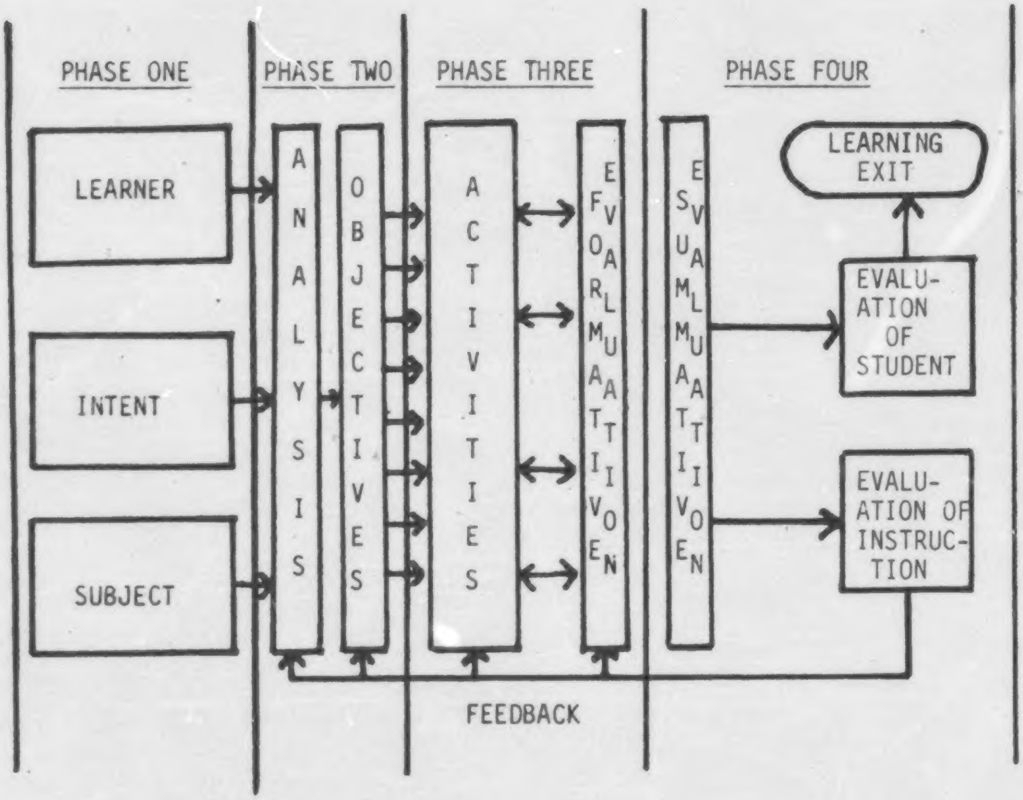
PHASE ONE
PHASE TWO
PHASE THREE
PHASE FOUR
LEARNER
INTENT
SUBJECT
ANALYSIS
OBJECTIVES
ACTIVITIES
FORMATIVE EVALUATION
SUMMATIVE EVALUATION
LEARNING EXIT
EVALUATION OF STUDENT
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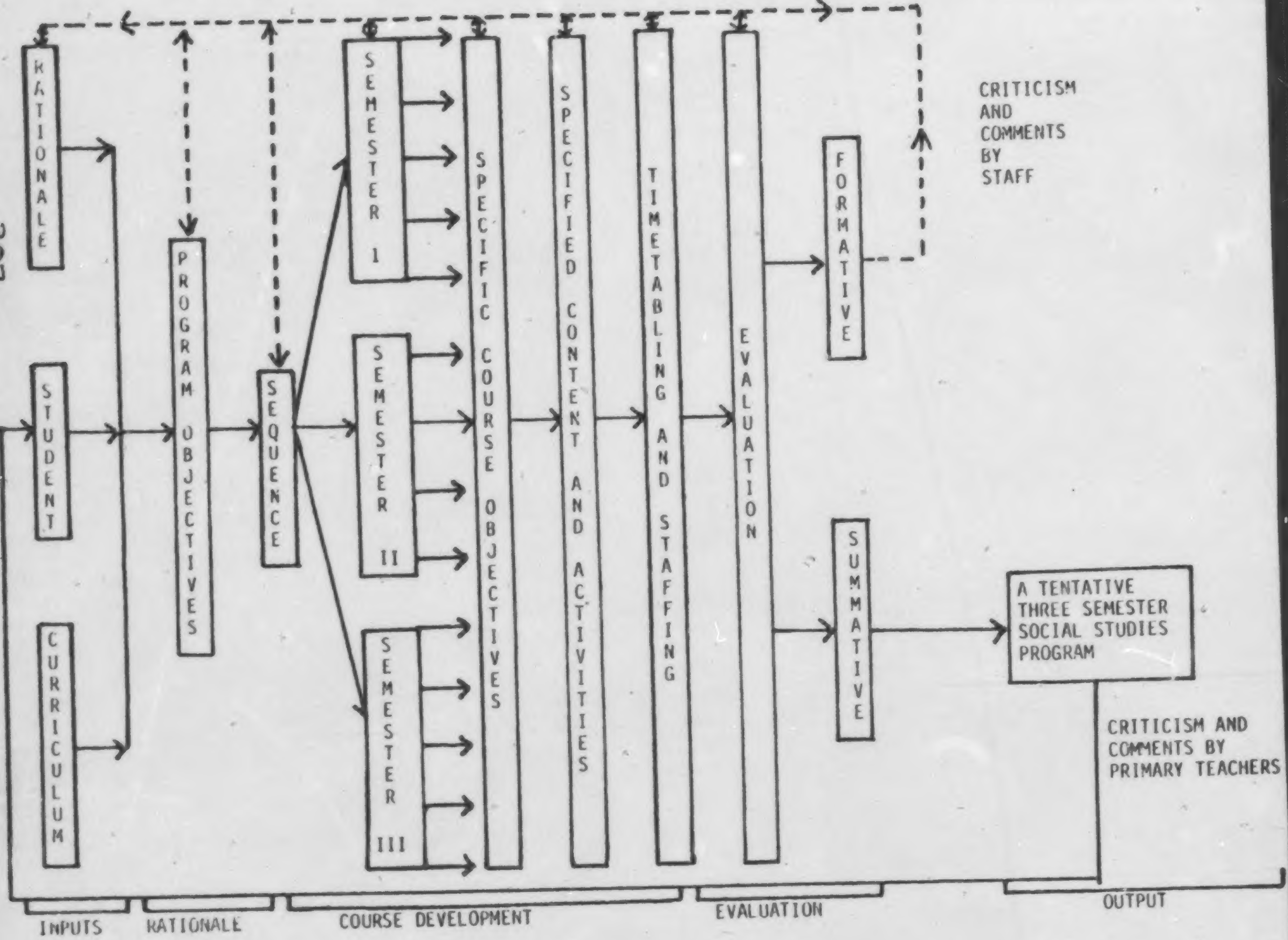
RATIONALE
STUDENT
CURRICULUM
PROGRAM OBJECTIVES
SEQUENCE
SEMESTER I
SEMESTER II
SEMESTER III
SPECIFIC COURSE OBJECTIVES
SPECIFIED CONTENT AND ACTIVITIES
TIMETABLING AND STAFFING
EVALUATION
FORMATIVE
SUMMATIVE
CRITICISM AND COMMENTS BY STAFF
A TENTATIVE THREE SEMESTER SOCIAL STUDIES PROGRAM
CRITICISM AND COMMENTS BY PRIMARY TEACHERS
INPUTS
RATIONALE
COURSE DEVELOPMENT
EVALUATION
OUTPUT

FIGURE 2: SOCIAL STUDIES COURSE PLANNING PROGRAM

UNIT	CONTENT	THEORY	PSYCHOLOGY	CURRICULUM AND INSTRUCTION
I	Organising concepts and skills of the contributing disciplines to the social studies curriculum.	Social studies is a means of presenting an integrated treatment of society based on the contributing disciplines. This integrated treatment must be discriminating and choose only those disciplines which are relevant to the study of any particular topic.	An introduction to major psychological constraints in translating social studies theory into practice - - child development - temporal schemata - spatial schemata - perception - conceptualisation - language	Curriculum The development of a conceptual structure in the social studies based on Content, Theory, and Psychology and with reference to the Queensland Social Studies Syllabus. Instruction Simple applied activities based on the Teaching Process Unit I.
II	Organizing concepts and skills of the social studies curriculum as a basis for the development of teaching competence.	Social studies uses a variety of teaching skills and strategies:- (a) exposition (b) concept development (c) inquiry (d) problem analysis and decision making (including role-playing, values clarification and simulation) (e) evaluation.	An elaboration and application of psychological constraints as introduced in Unit I as a basis for planning lessons, selecting resources, choosing appropriate strategies and associated skills.	Curriculum Translation of syllabus aims and objectives into specific objectives for classroom instruction. Instruction Development and trial of lesson plans incorporating a variety of resources, strategies and skills and drawing upon the content of the Teaching Process based on Units 2/3
III	Review of the social studies curriculum with reference to Australian and overseas	1. Review of the content, conceptual and psychological bases of the soc-studies curriculum. 2. Developmental activities including planning and evaluation.	Review of Units 1 & II.	Curriculum 1. Planning a social studies curriculum across the years. 2. Planning units for a particular year. Instruction Simple classroom research related to curriculum planning.

TABLE 1: AREAS OF COMPETENCE SEQUENCED BY SEMESTER

TWO SIDES OF ONE COIN? TEACHER DEVELOPMENT AND SCHOOL-BASED CURRICULUM DEVELOPMENT

by BARRIE MCELROY*

Abstract. This investigation grew out of a concern about the average teacher's perception of, and desire and ability to cope with the significantly changed decision-making role demanded by school-based curriculum development. The paper briefly reports some of the findings of case studies of two Pilot Groups of the Schools Council Curriculum Development Project: Geography 16-19 Project. Some tentative personal conclusions are drawn. It is concluded that school-based curriculum development demands an extended professional role of the teacher, and that this needs effective in-service teacher education. It is recommended that effective in-service education must continue for a lengthy period, be focused on a concrete curriculum development task, be organised in a group of teachers with some expert input, and depend on strong, sustained motivation. These conditions can be met best in the context of post-graduate courses it is suggested. It is postulated that changes in pupil and teacher behaviours, like those proposed by the Geography 16-19 Project, are strongly resisted because they threaten the traditional order and social control characteristics of school.

The teacher's role in curriculum development has changed significantly in recent years. New curricula and project materials for secondary school geography and recent developments in the philosophy of education and theory of learning have called for some new roles for the geography teacher. Commenting on the importance of the teacher's role Skilbeck claims that

> successful innovation is generally dependent on the teacher to a degree that is still commonly underestimated. (1975, 8).

It has been suggested that the greater the teacher's involvement in the development of an innovation the more likely is he to adopt it (Skilbeck, 1975, 99; Dalton, 1977, 43). There is a strong movement in current Schools Council curriculum development to mobilize teachers in the development stage of national projects, and to provide Project materials and courses which depend in part on the teacher as a school-based curriculum decision-maker as in the example of the Geography 16-19 Project (Schools Council, July 1979). This trend to a greater emphasis on school-based curriculum development highlights many apparent constraints to both curriculum development and implementation in schools, and in particular has raised the question of teachers' ability and preparedness to adopt the more exacting role of curriculum developers. This increased emphasis on school-based curriculum development exposes every weakness in teachers' skills in this decision-making role, highlight institutional constraints to such development, and raise the issue of which kind of teacher education best fits them for the task.

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THE ISSUES IDENTIFIED

The investigation which is partially and briefly reported in this paper probed these three basic issues. How did teachers perceive

(1) their professional role in curriculum development,
(2) those constraints that hinder them from effectively fulfilling a school-based curriculum development role, and
(3) the in-service teacher education implications of this form of curriculum development? (McElroy, 1980)

Given that successful curriculum implementation depends on teachers and how they see their role and the constraints in which they seek to develop the curriculum it seemed imperative to probe teachers' perceptions. How teachers perceived their own needs for professional education and development similarly commanded investigation. Together these suggested that a major area of scrutiny were questions relating to the relationship between school-based curriculum development and teacher development.

Dalton's (1977) research suggested that those teachers with better and more recent professional qualifications understood and performed the curriculum development role more effectively. Furthermore because growth in the teaching profession is currently negligible it is mainly those now in service who will be expected to perform a curriculum development role and who may therefore benefit from a specific education in it (D.E.S. 1977, 29; Auchmuty, 1980). The investigation was consequently restricted to the in-service aspect of teacher education for that role.

The choice of case studies of two Pilot Groups from the current Schools Council Curriculum Development Project: Geography 16-19 was appropriate for several reasons. Most notably this Project has sought to use teachers in the development of the overall framework and it depends on development by the classroom teacher. The Project is absolutely committed to the philosophy of school-based curriculum development at both the national and classroom level.

Besides the use of teachers in the development of a Geography 16-19 curriculum the second broad intention of the Project was

> to help teachers, by means of this involvement, to appreciate their role as curriculum developers. (Naish, 1976)

As the Project assumed with Light 'that development and training are inextricably bound together' (1973, 107) case study of Pilot Groups allowed interrogation of the in-service teacher education implications of school-based curriculum development.

This investigation was not an evaluation of the whole Geography 16-19 Project. The study was not concerned with product. It focused entirely upon process, but not the entire process. Only those issues that teachers perceived as effecting their role, the major constraints, and the in-service implications of the curriculum development process were considered.

This paper comments even more narrowly on some of the major findings relevant to curriculum/teacher development and says little about the constraints illuminated by the case studies. The meanings ascribed to these case studies agree with Light (1973, 107) that teacher development and school-based curriculum development are but two sides of one coin, 'two aspects of a single process' (Skilbeck 1975, 103).

A CASE STUDY APPROACH

The reporting of case studies in a brief paper such as this is necessarily frustrating for both the reader and the researcher. The value of the case study method used in this investigation normally relies on the studies themselves speaking directly to the reader. This report restricts itself mainly to presenting the meanings and interpretations of the researcher, albeit informed by his reading and experience. The empirical data were largely gathered by means of tape recorded interviews. Only very bald and inadequate illustrations of these are provided from the fuller studies.

It is certainly not the purpose of this paper to survey and justify case study and the related illuminative and ethnographic methods as a whole. The development of the method has been well documented in literature (e.g. Hamilton, 1977, 1976a, 1976b: Humble and Simons, 1978; Jenkins, 1976; Kemmis, 1977; MacDonald and Walker, 1974; Morris, 1977; Shaw, 1978; Simons, 1980; Stake, 1978; Tawney, 1976). However some characteristics deserve a terse mention.

Walker stresses the need to report not only results, but also methods for he sees case studies as exemplars whose meanings can be put to the test by practitioners in their own setting. He sees the situational verification as case study's equivalent to replication (1974, 25). The unique nature of each case did not allow comparison or generalization to other groups. It was intended that these studies may stand as mirrors that can reveal strengths, blemishes and deficiencies in curriculum/teacher development practice. The study of the particular has merit even if one does not completely agree with William Blake's assertion that

> To generalize is to be an idiot. To particularize is the lone distinction of merit. General knowledges are those that idiots possess. (quoted in Stake, 1978, 6)

The particular relates more closely and strongly to the actuality of experience and therefore provides more convincing information for decision-makers.

It is the unique nature of each case which makes the studies so different from experimental and survey research designs with their primary concern to generalize rather than interpret the particular within the context. The only sense in which the case need be seen as representative is that it must present an image of reality, typical or atypical, that is recognizable as truth.

Case study speaks to the decision-maker involved in the kind of curriculum/teacher development process reported in this paper of a world he knows at a common sense level and provides him with information of appropriate currency. Case studies communicate more clearly to teachers because they relate more directly to their 'daily experience' than does the language of experimental and survey methods and 'they tend to have a more human face' (Shaw, 1978, 2). Narrative in the first person was an attempt to involve the reader vicariously in the portrayed process.

MacDonald and Walker see case study as art which portrays an instance of time and social action in such a way as to communicate some lasting truth about the social process (1975, 2). The portrayal of studies of teachers' perceptious of curriculum/teacher development at work in the Geography 16-19 Project may then raise some possible universal verities for further testing as well as helping clarify the particular instances. Such was Tolstoy's modest rationale in offering that classic portrayal of the school at Yasnaya Polyana.

> In presenting a description of the Yasnaya Polyana school, I do not mean to offer a model of what is needed and is good for a school, but simply to furnish an actual description of the school. I presume that such descriptions may have their use. (1862/1967, 233)

The literature surveyed, largely ignored here, has a major contribution to case study. It provides a setting of definitions and postulates against which the reader may test any meanings he begins to see in the portrayal so that he may formulate the hypothesis he wishes to test in his own situation. The literature prepares the case study worker to be more aware and responsive in interviews to the meanings and significance of the perceptions being gathered. It provides context and criteria which enable him to probe the perceptions expressed and so to sharpen and refine them.

As in the collecting of data and its selection and portayal the case study worker who becomes involved in some level of interpretation must play the role of broker among the multiple realities. The kind of contingency interpretation used in this report employs judgement rather than passes judgement.

In contrast to positivist models of research where the rationale and purpose are control case study is emancipatory and encourages reflexive interaction between insights and the situation or process under study. The reader is encouraged to make his own assessment and to test any insights in the crucible of his own setting.

THE PILOT GROUPS STUDIED

The two Pilot Groups of the Geography 16-19 Project chosen for study were selected because of their contrasting geographical, economic and social settings. These groups comprised teachers from neighbouring schools and performed major development tasks with all aspects of the Project. Case Study A was of the Arden County Pilot Group. Arden is an English County bordering Greater London with pleasant rural lands, old cities, newtowns and many villages and hamlets. Case Study B was the Blaketon Pilot Group. Blaketon is a compact, currently depressed, nationally renowned 'tough' borough of a large English industrial city.

PERCEPTIONS OF THE TEACHER'S ROLE

Part of the difficulty of defining a clear role for teachers in the curriculum development process ties in the innovative nature of most such enterprises and the professional attitude of the teachers.

Several writers have characterised alternative views of the teacher as 'craftsman' or as 'professional' (Broudy, 1972, 8). The best known expression of this distinction is Hoyle's. He describes the teacher craftsman as a 'restricted professional' who has 'a high level of classroom competence, teaching skill and good relationships with pupils' (1973, 98), but who 'follows fixed rules and procedures' and whose 'work is characterised by uniformity and lack of innovation (1969, 389). Hoyle believes that

> there is a strong argument for extending the professionalism of teachers since solutions to educational problems cannot be fully standardized and require the flexibility, adaptability and insight of the professional. (1969, 390)

He calls this extended professionalism and says that it embraces 'restricted professionalism' as well as other attributes which include:

> seeing his work in the wider context of community and society; ensuring that his work is informed by theory, research and current exemplars of good practice; being willing to collaborate with other teachers in teaching, curriculum development and the formulation of school policy; and having a commitment to keeping himself professionally informed. (1973, 97)

This is a demanding definition of teaching and can be further complemented and complicated (Duckers, 1975), but has become the essential view taken by recent curriculum projects, including Geography 16-19. From the beginning the Project has held 'to the basic notion that curriculum development grows through the enhanced professionalism of teachers' (Kent, 1979, 2). He sees 'the "process" of developing working curriculum groups ... as being as important as any "product"' (Kent, 1979, 2). In this sense the Geography 16-19 Project has an overt in-service teacher education function that will be mentioned later.

Most of the teachers in the Arden group gave me the impression that they had cast themselves in an extended professional role. Bentley thought a good teacher needed 'a certain amount of imaginative creativity' as well as 'a certain intellectual power of seeing the wood for the trees' in curriculum matters, and the ability to 'sort out' and design syllabuses. Several of the group were doubtful whether the average teacher was very interested in adopting a major curriculum role. I asked Jo Brown whether the average teacher was the kind of professional who saw it as part of his job to have such an involvement and got this reply.

Brown: From my experience of average teachers, no. I don't think the average teacher is particularly into curriculum renewal.

White saw a reason for non-involvement in the lack of acknowledgement given teachers for such work. Others thought that the role demanded more time and personal commitment than the average teacher was prepared to give. In Bentley's view this may be reasonable as teachers had a responsibility to be whole persons and not completely wedded to their job.

When we were discussing Hoyle's view of extended professionalism I asked Riley, the group co-ordinator, 'Is that a fair thing to ask of teachers?' He replied

> Yes, I think it is. I think it's a fair thing to ask of all teachers.

However he went on to qualify this opinion.

> I think it's an unfair thing to ask of teachers who are going through the system as it exists in this country at the moment ... because I don't think they are equipped to do it, the majority of them.

He seemed to speak for the group in upholding an ideal of extended professionalism, but was practical in recognising that a majority of teachers lack the necessary skills and work under severe constraints.

This opinions was supported within the Blaketon group. Pat Ferrier saw the average teacher, many of whom are acknowledged as 'very good in the classroom', as falling short of the initiative and innovative commitment necessary for teacher-based curriculum development. The level of dedication expected was made plain in the statement:

> I think that many of them .... feel that teaching shouldn't engulf you .... which it does I'm afraid.

In many schools apparently the first criterion of good teaching in the classroom seems to be control. Noting that it is a tough area in which to teach Mark Glover said:

> There's a prevailing attitude in a lot of places in Blaketon .... that if you can keep kids quiet you're successful. And this is the level at which, in this area, a lot of teachers are being assessed.

James Smith, the group co-ordinator, included that in his description of the average teacher whom he sees as Hoyle's restricted professional.

> By reasonable I mean that he keeps them under control .... they learn ... some of them learn so much on this basis of chat and write. And he keeps his marking up to date. He runs an after school club. He attends the odd course.

Smith saw Hoyle's extended professional as being necessary to the complete success of a Project like Geography 16-19 and felt that their Group struggled a bit as it tended to be

> an example of really the restricted professionalism at work in an extended professionalism situation.

Most of the active participants were not explicit about the professional nature of their role, but their difficulty in coping with the extended aspects of it implied a hitherto restricted perception.

In Arden Jo Brown claimed that teachers are frequently willing to change the content and materials they teach, but are very resistant to changing the way they teach. He, with Riley and Bentley, spoke of the apparent difficulty the group had had in shifting from a dominantly expository, 'chalk and talk' mode of teaching to the Project's student enquiry mode. The co-ordinator added that the group had had an 'expectation that they should be innovative and novel', but that they had largely conceived and practised this in 'providing novel geography rather than novel teaching methods'.

A good description of the traditional teacher role in curriculum decision-making was given by White.

> It was so nice before when you were teaching. Somebody said, 'Well, look we want to start A-level geography in this school and you, White, you're here, will you start it?' So you went to your friend and found out some viable textbooks. And you took them away and you knew that if you followed the content of those books you were all right.

He contrasted this with the Project approach.

> It's not, as I see it at the moment, going to be that way with this new 16-19.

The difficulty with this new approach seemed to derive both from its style of geography and its markedly new pedagogical stance.

Jo Brown described the restricted professional.

Brown: I think you've got to recognise that teachers are human ...
McElroy: .. almost ..
Brown: .. almost .. and if you've got something ready made then
it makes life a lot easier and keeps a lot of people happy.
I think it is very significant, for instance, that the
most popular national project is the Geography for the
Young School Leaver one, because all the materials are
ready made there.

Brown also thought that many teachers were not using these materials in a 'very professional way'.

Discussion of the nature of teacher professionalism in Blaketon elicited somewhat similar responses that highlighted a restricted content oriented role. The teachers felt more at home with the unit development, but tackled it in the normal pragmatic, content orientated manner. This is described by Carter and endorsed by Gray, both tertiary lecturers, in the following excerpts from a conversation in which I had asked whether the teachers had been stronger in certain areas of curriculum development.

Carter: Well I think that initially they were, well almost to
the end, they were content orientated. Wouldn't you
say so?
Gray: Oh, very much so. And ....
Carter: And that the objectives were very much the afterthought
on most occasions ...
(   )
Carter: (   ) if Jim had had his way, I mean we would've
.. put it very much in a curriculum development framework
all the time. But you probably know the average ....
main subject exponent, irrespective of subject, will work
the other way around you know ...
McElroy: That's right. Taylor made that point nearly ten years
ago didn't he?
Carter: .... and people are only just beginning to believe him
....
Gray: That's right. That's right. And er .. you know ... we

> would do the content first and start scratching our heads and saying, 'Well, which skills are in that, and which values are in that,' and so on and so forth. In truth we would have been quite happy for Jim to go away and do that for us .... You know, it might sound cynical, but that's the way we worked.

It was with a sense of frustration that Jim Smith noted Steve Gray's reluctance to be involved in the whole process and that he 'wasn't interested in the curriculum construction side of it'. Smith more readily accepted the teachers' content orientated stance, suggesting that:

> The important thing is that you start from where teachers are ... and largely teachers are at content to start off with ... And you can tease out the purposes behind the content if you use objectives efficiently.

One teacher in response to my question about how adopting teachers would cope with the curriculum development demands of the syllabus, after initial bemusement at the thought of any such role, replied:

> What is really ..... they will just be taking on a new course and er .... taking all the package work that's already been done.

Another teacher saw the syllabus as requiring quite a bit of work from adopting teachers, but of a narrow kind as they would have to 'start from scratch, making a fresh set of notes'.

Teachers in the Arden group spoke of sources of resistance to teachers adopting fuller curriculum development roles. These included the teachers themselves and the school system in which they worked. Harking back to his own experience Simon White told me of his reaction to the 'new geography'.

> I was scared stiff when I heard all these rumours about the new geography and was almost instinctively anti out of preserving my own situation and possibilities.

This inclination of teachers to protect themselves was frequently remarked and recognised as a normal human reaction to the new and unknown. Bentley spoke for several of the group in suggesting that this was aggravated by the teachers' anxiety to get good examination pass rates.

> You see, as a teacher we see the syllabus through the examination ... That's the sort of filter we've got.

He saw teachers as fearing failure in a system that measured success by pass rates. Riley thought it unfortunate that the Project had sought to capitalize on the prestige that examinations bring for this reinforced the conservative tendencies of teachers. Morton told me how innovation exposes skills inadequacies in teachers which in turn saps their energy and interest in a course. Bentley's prognosis for this attitude in the current trend of an 'education service under stress' was to predict an even greater tendency to self-protection and reaction.

It was interesting to note that the teachers of the Blaketon group, who generally had had more difficulty in grasping the pedagogical philosophy and innovation of the Project, felt that their schools were 'receptive to new ideas' and 'fairly open to change'. Their co-ordinator was less convinced. Comments from the Arden County group were in marked contrast.

Concerning their curriculum development role several teachers reported feeling 'unique' or 'atypical' within their schools whether or not that was literally true. In describing those schools they told me: 'I don't think we are terribly progressive as a school'; 'This school's atmosphere is, "We don't want change."'; and 'This school is prepared to see children motivated, but some things demand a fair bit of co-operation.' I was told that this latter school was nervous of 'new' methods such as fieldwork and simulations.

Frequently it appeared as if the schools would accept change in content and materials, but changes in the behaviour patterns of teachers and pupils were strongly resisted. Edward Bentley sensed within his school some disapproval and possible envy of his curriculum development role.

Bentley: You sense this, 'Oh yes, you're going off on your thing again.' It's like going out with another woman really. I'm using these loaded male terms. (   )
McElroy: Partly condemned, but also envied.
Bentley: Yes.

It was thought to require some courage for a teacher to explore the frontiers from such a conservative base.

When one speaks of a changed teacher role in curriculum decision-making one is ultimately talking about an altered behaviour pattern. Behavioural changes appear to require the pre-conditions of changes in intellectual understanding and also attitudes and perceptions. The greatly increased decision-making role required of teachers places them in conflict with much of the protective, feudal curriculum development structure described by Slater and Spicer (1979). The new role demands skills that teachers may not have and asks them to function in areas of responsibility where they have little confidence. Their response is often retreat.

It is far too severe and simplistic to lay the blame for this retreat wholly on teacher conservatism. The preservation of a personal and professional self-image in the face of powerful socializing forces such as schools and examinations is a normal, human reaction. Even those teachers interviewed in these case studies, whose involvement stamps them as more open to change than the ruck, still tended to have a strong expectation of external syllabus and examination control, take content (often from a textbook) and suggest expository teaching methods, and to limit most change in their curricular thinking to the geographical content.

Teachers and schools can be persuaded to change the ideas, content and materials of their teaching, although not easily. It is when ideas and attitudes become manifest in new behaviour that threatens the social behaviour patterns and social control structures of the school that strong resistance to change is mobilised. It seems that it is the pedagogical element which has a profound potential to change classroom practice that makes teachers nervous of change.

It may be possible to educate teachers to have the knowledge, skills and desire to perform a new curriculum decision-making role, but they will only attempt to practise it when they feel free to do so, and when they believe it will enhance their professional self-image. Such changes in role presuppose changes in the characteristics of in-service teacher education and in aspects of the total school curriculum system.

PERCEPTIONS OF EFFECTIVE TEACHER DEVELOPMENT

The importance of specific preparation for a curriculum development role was stressed by many of those interviewed. Without such 'training and background' Riley thought it was 'totally unfair to ask a teacher to suddenly get involved in it'. He believed that they ought to be put 'through some process, or initiation' which would give them experience and involve them with theory. Teachers in these Pilot Groups testified to the changes to their ideas and practice wrought by their involvement in the Project. Understanding of the Project's discipline stance came fairly quickly, but it would appear that understanding of the Project's pedagogical philosophy happened later and took longer.

Such changes demand a lengthy learning period, strong motivation, support from the school system, appropriate tasks to assist learning, and interaction with a group of teachers, it was strongly suggested. Balance between getting an essential understanding of the fundamental philosophy which would underpin the curriculum decision-making and preparing one's own piece of work was stressed by White and endorsed by others.

It is abundantly clear that school-based curriculum decision-making demands an extended professional role of the teacher. The teachers interviewed certainly believed that they could perform an extended professional role if appropriately educated and supported. Certain elements of their curriculum development experience were essential to effective in-service education.

Everybody in the Arden Group spoke to me fervently of the prime place of the group in curriculum/teacher development activities. The group process was lauded for the variety of input and probing that came from teachers with various interests and strengths in geography teaching. Teachers seem to benefit little from lectures from experts, but much more from engaging in dialogue with other teachers. Experts within the group have the role of consultants who challenge, probe and guide. It is in a group that teachers best seem to learn curriculum development skills, polish their products and build their confidence to develop and use these products.

The importance of having placed one's ideas and work under scrutiny was made plain to me. In a planning meeting I had observed Brown presented a paper which was helpfully criticised by the group. Brown seemed characteristic of the group in suggesting to me,

> I don't mind if it is shot down, but at least it forms a basis for discussion.

Bentley qualified that apparent openness, claiming that while teachers were willing to expose their ideas in a group they were far more reticent to expose their practice in the classroom, either by observation or discussion. He suggested that the closer they came to discussing

> really how you're going to be doing things in the classroom ... (   ) the more we waffle ... We sort of cloud it with a great cloud of verbosity.

He saw this as a weakness in the teacher group process which derived from a very natural, human failing; the defence of our professional self-image. This was particularly acute among those involved in innovatory curriculum development because they did not wish to appear conservative or traditional in their approach although they often were in practice.

Both groups attested to the fundamental importance of first building good group relationships. The following extract from a Blaketon interview shows this.

Griffin: We actually didn't do any curriculum in the first term. We were just talking about it.
McElroy: That's more a learning period?
Griffin: That's right, yes. Very much so.
Purdom: I think ... perhaps finding each other out a bit as well.
Griffin: Yes ... as individuals. That was interesting too.
McElroy: How significant is that? That seems like an interesting point ... Is that pretty important if you are working in a group?
Griffin: Yes, very much so ... We were all different people and .... it took a long time to get into a unit ....

They went on to explain how it was important for them to develop confidence in their new colleagues and themselves before they could work freely together.

Martin and Wheeler described everyone as wary, non-committal and self-protective in the early stages until they got to know each other. This was seen by them as necessary socialization and integral with their learning. This appears to have been a crucial stage in the process for all the teachers; a kind of threshold before which little useful work or other learning could take place. Several of the teachers appeared to mark their professional growth during the Project largely in terms of their having gained confidence to bare their work for scrutiny. Carter believed that the expectation that one's work was to be critically scrutinized, especially by an expert, not only enhanced the value of the discussion and consequent teacher development, but also that 'the quality of that work improves enormously'.

The co-ordinator of the Arden County Group identified two major characteristics of effective in-service education.

McElroy: What sort of help will teachers need if they are going to come through the same process of learning that your group has come through?

Riley: I think there are two things one can immediately identify. One is that they will probably need to work together in a group. ( ) There's a certain strength in that. Secondly, they're going to need help from some sort of outside agency.

He went on to detail the support and guidance he deemed essential from Advisers, Teachers' Centres, local Colleges and Universities among others. Concerning in-service education itself he identified three essential characteristics: 'definite commitment'; 'definite focus'; and a 'lengthy period'.

The moral commitment to completing work for the Schools Council Project was likened by one teacher to the personal contract one enters when enrolling for a degree course. All seemed to agree on the need for the definite focus of a common, concrete task to avoid such curriculum/teacher development from becoming abstract, sterile and soon abandoned.

The need for a definite focus was generally conceived as the need to be involved in a task which was of positive and direct personal use in the classroom. It must be one's own and it must be concrete, was their message. It was thought that a measure of freedom was absolutely necessary for the teacher to feel that the product was his. Usually this freedom was defined within the limits of a framework and with reference to support and guidance.

Most problematic and yet absolutely fundamental to effective in-service is the need for it to continue for a lengthy period, probably twelve months or more. From the evidence of these studies it seems that a group needs time to develop effectual interaction and a foundation of mutual confidence. The teachers need time to reflect on, assimilate, accommodate, translate and apply the new ideas and attitudes that are proposed by curricula like that of the Geography 16-19

Project. Isolated, short courses are totally inadequate in changing teachers' approaches to their curriculum development role.

When speaking of time the teachers suggested many preferred characteristics of in-service work of this kind that match the long courses normally associated with College and University post-graduate awards. Thorough familiarity only came from a long period of handling the ideas and of applying them, Morton and Howard claimed. Some teachers stressed the value of deadlines in encouraging better thinking and work. Several had greatly valued the regular fortnightly meeting. Although Riley did not believe they had to be that frequent he did agree that at least one year, and maybe two, was an essential minimum length of time to be involved if teacher behaviour was to be affected.

These teachers frequently mentioned a variety of incentives necessary for genuine encouragement rather than passive permission to become involved in curriculum/teacher development. They suggested that teachers, other than the few enthusiasts, needed some form of time compensation, status or promotion reward, recognition beyond their school, credit towards higher degrees, and the prestige of association with a College or University. Both curriculum development and the associated in-service education must be seen to be valued if the participating teacher is to retain or enhance his self-esteem.

Teachers generally are not trained or supported as curriculum developers and yet the need has been frequently noted in the literature. A South Australian survey recommended in-service support for teachers in their curriculum development role (McElroy et al., 1977, 72). The Schools Council pamphlet on dissemination (1974, 23) argues strongly for curriculum development experience to be counted as in-service under the terms of the White Paper (1972). Watkins calls curriculum development involvement the 'most intense kind' of in-service (1973a, 11); while Kerr sees it as the 'natural core' of teacher education (1968, 9). The Geography 14-18 project team argues that curriculum development is a social process and a major element of that process is teacher development (Hickman, 1973, 33).

If it is true that teachers, as do children, learn best from their own experience then this must hold also for learning the role of curriculum developer while playing it (Rudd, 1973a, 114).

The best way of changing the teacher's curriculum development role is by effective in-service teacher education. It is only practicable in changing teacher behaviour when it has many characteristics commonly denied it in the short courses that have proliferated since the 1972 White Paper. These brief encounters may have served admirably in conveying information, or temporarily enthusing teachers, but have had demonstrably little effect in changing behaviour in any but the most highly motivated and skilled teachers.

Smith, the Blaketon co-ordinator, attached great importance to the teacher development aspect of the Project.

> McElroy: You mention the teacher education aspect .... Just how important do you see .... the teacher development side of what they have been doing is?
>
> Smith: I think that's very important really ... It's process that's, I think, more valuable than product. I think product gives the motivation. (   ) I mean what is produced may be inferior to .. what some academic working on his own could produce. But it's putting people through the process that's particularly valuable. If you can combine that with inputs of expertise ... from such people as higher education people, in content terms, I think that's valuable.

Jim Smith valued the process so highly as in-service education for teachers that he was obviously prepared to trade off a little in terms of product quality to achieve it. Carter, one of the Higher Education links in the Pilot Group, on the other hand doubted the teacher development value of the Project.

> For instance if you said to me, 'Have we changed on a long term basis these teachers?' I would say, 'Probably not.'

However it was claimed by Riley that the Arden County group had gained considerably from their involvement.

> I think they are more aware now of the various ideas which are current within curriculum reform and curriculum change and design. (   ) They are better equipped to deal with it than they were before. (   ) They are more professional in their attitude towards discussing syllabuses, curriculum, and teaching generally than they were 2½ years ago. (   ) They are more aware of what they are trying to do, of the problems, of the difficulties of doing it. And they are more aware of the needs for assessing and evaluating what they are trying to do.

SUMMARY OF PERCEPTIONS FROM THE CASE STUDIES

The unique nature of each case studied does not allow comparison nor generalisation to other groups. Nevertheless there is some limited value in collectively noting a few of the major issues of consensus and contention from the studies. These may help the participant or reader to establish hypotheses worth testing in their own situations. The researcher's comments and inferences depend on his personal insight.

Consensus was evident on many issues. Teachers generally value their autonomy although they may use it very differently. Their prime concern as curriculum developers was with geography as content. Similarly their approach to teaching was generally expository and narrow in range.

Universally they perceived lack of time as the major constraint to a worthwhile curriculum development involvement. Qualifying this most of them saw the demands made on their time in terms of priorities with the average school and teacher according a low priority to this role. Consequently most of these teachers saw themselves at a frontier and somewhat isolated and atypical within their schools. They perceived a lack of support that convinced them that their curriculum development role was not highly valued.

The teachers all credited the curriculum development process with having made them more aware and consequently better teachers. The major characteristics which aided this, they agreed, were the group process, the common, concrete task and the lengthy period of involvement and sustained motivation. They argued that the process of getting to know each other was an essential foundation to subsequent learning and production. Group criticism, based on mutual respect, was the aspect of learning and curriculum development consistently praised. These conditions may best be met in the context of a post-graduate award. However schools as well as Colleges and Universities would need to relax some of their traditional thinking and rigid organisation to encourage such a modified venture.

The differences in opinion all seemed to derive from a range of views about the nature of the profession. The views of a teacher's professional role ranged from Hoyle's restricted to extended definition. Consequently the nature and degree of involvement and the description of an appropriate role varied considerably. The curriculum development role of the classroom teacher was conceived between the very restricted choosing of a textbook and expostiory teaching model to the extended view of a curriculum decision-maker establishing his objectives, materials and methods from first principles.

Whereas there had been agreement about the geographical philosophy of the Project there was disagreement about the pedagogical approach and the need to have any such philosophical underpinning. Perceptions varied widely about how amenable schools were to adopt and nurture more extended roles of curriculum development. Opinions differed on how effective was involvement in such curriculum development in actually changing teachers' curriculum development and classroom behaviour.

A measure of consensus, while often not made explicit, was sensed that highlighted the great significance of personalities and educational climates. Personal perceptions and personal relationships within the groups had obviously greatly affected their functioning and the participants had recognised this and made good use of that knowledge. High motivation, goodwill among participants and valuable learning experiences stood in contrast to persistently narrow teaching practice. It was implicitly agreed that, despite intellectual belief and good intentions, the strongly perceived pressures of conservatism within a school or society generally would continue to thwart curriculum innovation and changed classroom practice.

Given some appropriate adjustments to the system such as those suggested by the teachers in this investigation it can become more conducive to change. Proposed alterations included a more flexible use of time in schools; the clear statement of a school's educational philosophy, objectives and priorities; revised status and promotion structures to reward the teacher's curriculum development role; and a release scheme that obliges all teachers to undertake curriculum/teacher development as a professional responsibility.

A recognition that they are but 'two sides of one coin' would allow an improved in-service education programme to enhance teachers' performance in their role as of curriculum developers. All those involved, including Schools Council, Department of Education and Science, Local Education Authorities, teacher educators and teachers, must evaluate their roles and responsibilities. Their response to these case studies should be to put to the test any insights they may provide about curriculum/teacher development and the system in which it functions.

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CONTENT ANALYSIS AS A TOOL FOR PROBING THE SUBSTANTIVE STRUCTURE OF GEOGRAPHY

by BERNARD COX*

Abstract. *This paper describes some ways in which techniques of quantitative content analysis may be used to probe the substantive structure of geography. This approach involves analysis of written expressions of geography. The thematic and structural analyses involve principal components analysis and cross correlation. These techniques enable identification of thematic elements of, and their location in, a chapter of a book or a journal article. The thematic elements may be used as the basis for recognizing concepts which predominate in textural material in geography.*

INTRODUCTION

This paper describes some ways in which techniques of quantitative content analysis may be used to probe the substantive structure of geography. Content analyses enable one to begin answering such questions as:

(a) Just what are the most persistent and inclusive themes and concepts in geography?

(b) Are the themes and concepts evident in many or all branches of geography; for example, in human geography, settlement geography, economic geography, geomorphology, and so on?

(c) How can they be identified?

(d) What evidence is there of structure (i.e. relatedness between themes and between concepts) in the substance of geography?

(e) How can the structure be represented?

A general characteristic of this approach is that it involves analysis of exemplars of written expressions of geography, for example articles published in stringently-edited journals, rather than the acceptance of philosophic statements about the nature of geography. The analytic tools described in this paper involve a set of procedures called Thematic and Structural Analysis (TSA) devised by Carss (1973) and applied by Cox (1975).

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Quantitative content analysis is concerned with the frequency of occurrence of given content characteristics. Objectivity and precision are important qualities found in this type of analysis. It substitutes systematic frequency counts for subjective impression in the collection of raw data. This feature has led to some criticism of content analysis that it is little more than counting. However, TSA possesses the following features:

i. the quantitative approach is organised so as to limit a priori classification of the data;

ii. the frequency and spacing of a given characteristic of content is precisely-measured, and

iii. relationships between the principal themes in the text are clarified.

Several issues should be considered in planning the use of techniques of quantitative content analysis. The first issue relates to sampling as a basis for gathering data. It was decided that sampling either randomly, or by page, or chapter, was inappropriate because TSA depends on a study of consecutive linkages between themes expressed in the prose. Content must therefore be drawn from the text in its entirety.

A second issue relates to what is acceptable as a datum. The selection of the unit for analysis is an issue that has not been fully resolved by content analysts. The unit may be the word; a phrase; a paragraph; a sentence; or blocks of equal numbers of words. The unit selected is obviously conditioned by the purposes of the study. Studies of disciplinary themes and the links between them are well built from units of content varying little from each other and yet enabling considerable flexibility for achieving combinations of units. Thus, the individual word should be selected as the basic unit of substantive content of written communications. The almost limitless possibilities for combinations of words allows extreme flexibility in constructing the themes in the text materials. When the succession of themes and concepts is considered, the paragraph should be adopted as the unit in which meaningful themes are stated. Thus, individual substantive words provide the data source for the themes, and paragraphs constitute a convenient vehicle for the expression of one or more themes.

A third issue involved in the use of quantitative techniques of content analysis, centres on the introduction of subjective judgements in the analytic procedures. Some content analyses have tended to be self-justifying because the investigator has selected a system of classification of data prior to making the analyses of the data. The distinctive quality of the TSA method of analysis lies in the facts that the sorting of data and the derivation of thematic elements in the prose precedes interpretation of the thematic elements. The identification of common substantive ideas in the thematic elements arises from the study of these themes after statistical procedures have extracted word associations. The following paragraphs describe the TSA procedures in detail.

The first phase in the TSA involves the selection of sources of data. Their selection relates closely to the nature of the curricular task being carried out. These tasks may include such investigations as (i) the identification of the key themes and concepts within a discipline, (ii) the attempt to devise multi-disciplinary learning materials by analysing disciplines separately and then attempting some synthesis of the key themes that are identified, or (iii) the structuring of written learning materials in ways which makes them consistent with structures appropriate for students to learn either by discovery or from exposition.

If the curricular task centres on the identification of the key themes and concepts of a discipline, TSA enables this to be done empirically but it demands that the disciplinary writing selected for analysis be widely regarded as exemplars of the discipline.

The second phase of TSA requires the recognition of key words in the prose. Key words are defined as the most frequently occurring substantive words in a journal article or textbook chapter. The location of key words within an article is important and this is recorded by numbering consecutively all of the paragraphs in the article.

Only words with many occurrences in an article are selected as key words because these carry the major substantive burden of the article. The key words and the frequency of occurrence of each, in every paragraph of an article are used to calculate a word by word intercorrelation matrix. (See figure 1)

A principal component analysis of the inter-correlation matrix is performed to extract lists of key words on the third phase of TSA. The term, thematic element is used consistently to denote the meaningful themes which are devised from the lists of key words. The initial principal components were subjected to a varimax rotation as an aid to interpretation. A general procedure that was adopted after the factoring was that any factor loading of less than 0.3 for a key word was regarded as not significant in

Para. No.	Cost	Location	Manufacture	Production	Mill	Industry	Ore	Plant	Aluminium	Area	Transport	Use	Supply	Labour	Gas	Process	Australia	Employment
0 1		3	2	1										1				
0 2		1	2	1												1		
0 3			6															2
0 4			2	1						1						1		
0 5	5	1	2								2	2		1				1
0 6	6									1	5	1						
0 7	5				1						1	1		1				
0 8	7	3	6			1							1	1				
0 9	2		1	1							2							
1 0		2	1	1	4							1				2	1	
1 1	3	2			1					1	1	1	1					
1 2	3	2			7	1				3	1		4					1
1 3	1	3			8	1				1			3					3
1 4		3			5					1	2	1						
1 5	1			2	9					2		1	2	1				
1 6		3					1				1							
1 7							5										1	
1 8							2											
1 9	3						8	2			3	2						
2 0							5	1		1						2		

Figure 1: SAMPLE OF A WORD BY WORD INTERCORRELATION MATRIX.
THE WORD LOCATION WAS USED THREE TIMES IN PARAGRAPH 1.

interpretation (Cooley and Lohnes, 1971). The results of the application of these precedures is short lists of key words, that made up the principal components. Factor scores are calculated for each component in each paragraph. The factor scores represent the prominence or 'amount' of each component in each paragraph. If the factor scores are plotted on a graph, the longitudinal trace of the component throughout the chapter is produced (see Figure 2). It represents graphically the stages in the chapter where the component is prominent or absent.

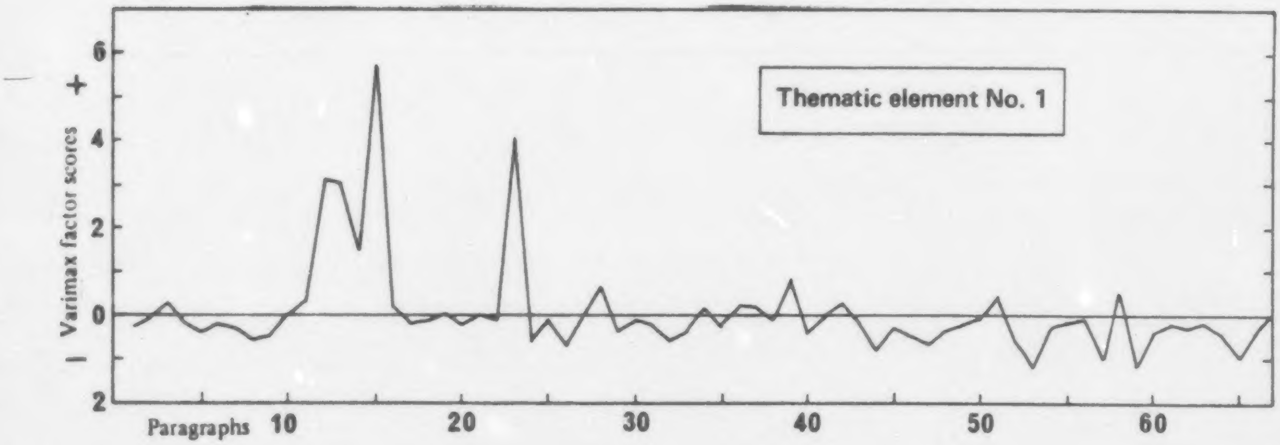

Figure 2: Longitudinal trace of a thematic element

Considerable care is required in devising the thematic elements from the computed lists of principal components. The crucial task consists of ascribing a meaning which faithfully reflects the meaning expressed by the author in all paragraphs highly represented on the particular theme. It is considered desirable that (i) the theme should be expressed as precisely as possible, (ii) that it should use the key words in the component and avoid the addition of other substantive words, and (iii) that prominence in the theme itself should be given to keywords with high loadings. Figure 3 exemplifies these tasks.

PRINCIPAL COMPONENT NO. 1		THEMATIC ELEMENT NO. 1
Key Word	Varimax Loading	
log	87	LOG MILLING: MILL SIZE IN RELATION TO AREA OF TIMBER SUPPLY.
mill	86	
large	77	
supply	60	
area	49	
timber	43	
increase	43	
scale	34	
sawmill	30	
PRINCIPAL COMPONENT NO. 2		THEMATIC ELEMENT NO. 2
refine	88	REFINING (MINERALS), EXAMPLE OF BAUXITE INTO ALUMINIUM AT KURRI KURRI.
bauxite	78	
ton	78	
aluminium	76	
smelter	72	
capacity	65	
Kurri Kurri	41	

Figure 3: Example of Principal Components and Thematic Elements.

The principal components analyses and the derivation of thematic elements are advanced as empirical means to the identification of (i) just what are themes expressed in an article or chapter, and (ii) what is the location of these themes throughout the text. The utility of this technique may well be stressed by pointing out that each thematic element permeates the chapter and does not exist as a self-contained block of information. Such a means of identifying key themes has considerable potential value to curriculum workers - substantive themes of prose are identified so that they may be used both in the analysis of curricular materials, and also in the compilation of new materials. Further, the superimposition of longitudinal traces for various themes begins to clarify the relatedness of ideas in prose writing in a discipline. This is illustrated by the coincidence of themes 1 and 4 in paragraph 15, in Figure 2. In this way, a start can be made on the identification of disciplinary structure, which is defined as the relationships that exist between key ideas in a discipline. It may be argued that the sequence of ideas is a crucial aspect of such things as (i) recognising the substantive structure of a discipline, (ii) the ordering of textual materials in which there is a logical progression of ideas, avoiding both redundancy and hiatus. The empirical identification of substantive disciplinary structure is carried further in the fourth phase of TSA.

A cross-correlation analysis is performed in the fourth phase of TSA on all pairs of thematic element traces. The purpose of this analysis is:

(a) to identify the covariation of themes; and especially

(b) to identify what sequences of themes exist in successive paragraphs.

The factor scores for each thematic element, when plotted on a paragraph basis can be regarded as a time series. Each factor score trace is cross-correlated with every other trace with a lag of 1 paragraph. Where computation reveals that a statistically significant cross-correlation exists between the traces of two lagged thematic elements, it has been inferred that one theme tends to follow another throughout the article, depending upon the strength of the correlation coefficient. Cross-correlations between themes may be represented on diagrams. Figure 4 is an example.

In Figure 4, note that theme 8 is prominent in paragraphs 26-29, that theme 15 is prominent in paragraphs 6, 9, 10, 26, 43, 51; that theme 6 tends to precede theme 15; that themes 10 and 3 tend to follow theme 15, and so on. The unbroken linkage lines represent a cross-correlation significant at a level of 0.05 or better; the broken lines represent other cross-correlations to a level of 0.1. The order of thematic elements in a diagram has been rearranged topologically in order to minimise the complexity of the pattern of linking lines.

This diagram (Figure 4) represents thematic structure. It shows graphically ways in which themes are placed and linked in prose - information which has both analytical and synthetic significance to curriculum workers. Close examination of the diagram reveals that there is some repetition of patterns of linked themes in different parts of the chapter in that certain themes tend to be clustered or occur in sequence.

A different type of structural diagram may be drawn to represent these basic patterns. These alternative diagrams showing structure are called 'idealised' because they encapsulate the statistically-likely patterns of cross-correlation among thematic elements in an article and are not time ordered by paragraph. Figure 5 is an example, and relates to the same text material as shown by Figure 4.

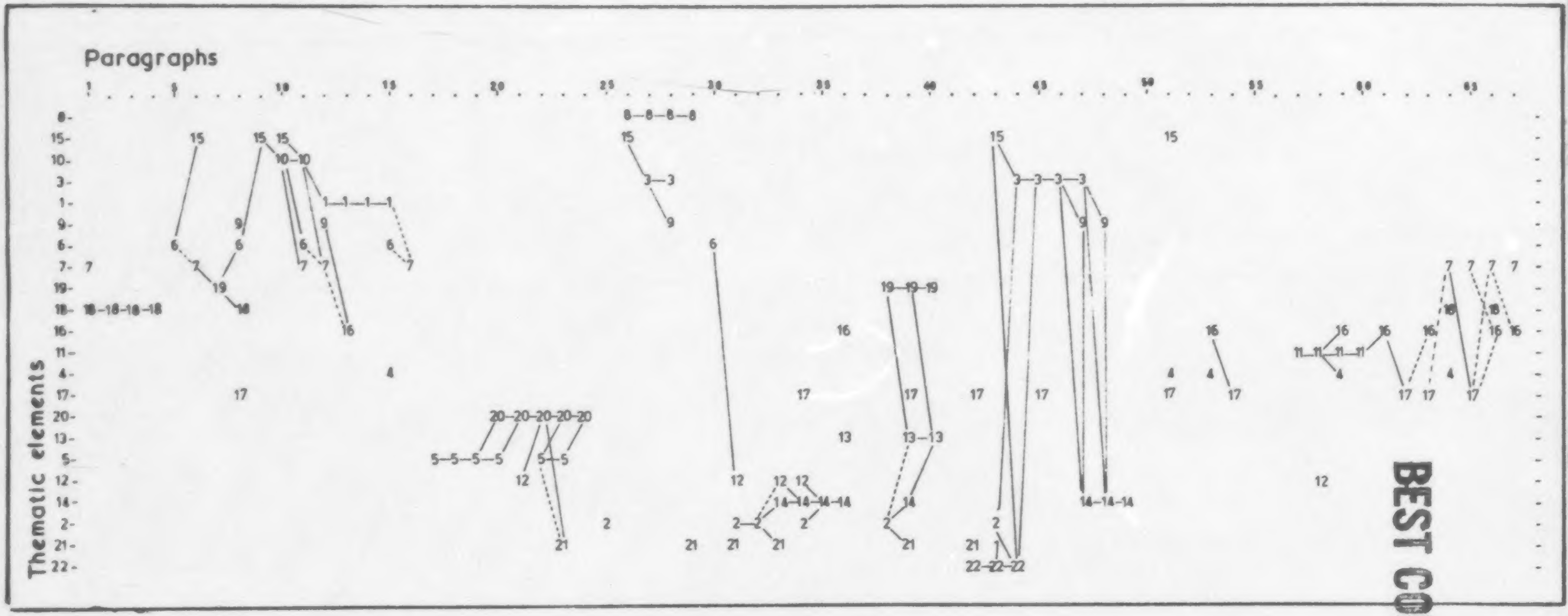

Figure 4: Thematic Structure

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KEY TO THEMATIC ELEMENTS (ABRIDGED)

1. Size of log mills relates to timber supply area.
2. Refining minerals - bauxite at Kurri.
3. Employment of labour in manufacturing.
4. Economies due to scale of operations.
5. Ore content and mining.
6. Raw materials accessibility and transportation.
7. Influences on manufacturing location.
8. Production of palm oil.
9. Supply of inputs to manufacturing.
10. Timber sources and milling processes.
11. Plants for the supply of town gas.
12. Electric power and its use in manufacturing.
13. Power availability and port development at Newcastle.
14. Aspects of Australian industry.
15. Reduction of bulk.
16. Patterns in the location of industries.
17. The location of firms.
18. Manufacturing activity.
19. Shipping costs and port facilities.
20. Copper content in ore and mining activity.
21. Mining and processing require various facilities.
22. Factors affecting industry at Kurri.

Figure 4: (cont) Thematic Structure

Idealised thematic structure diagrams are drawn by applying the following procedures:

(i) For a selected thematic element, record all of its significant cross-correlations with other themes.

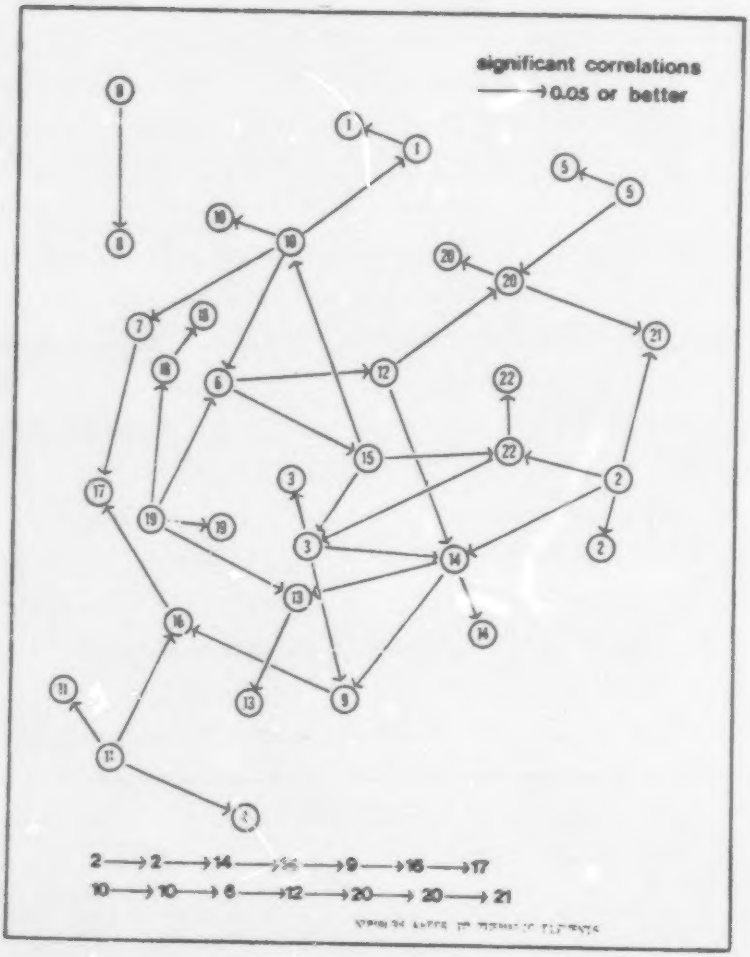
significant correlations
0.05 or better
2 → 2 → 14 → 14 → 9 → 16 → 17
10 → 10 → 6 → 12 → 20 → 20 → 21

Figure 5: Idealised Thematic Strucutre

(ii) Repeat this procedure for all other thematic elements.

(iii) Use a system of foci for themes and arrows for correlation linkages.

(iv) Draw each thematic element only once in the idealised diagram, except where it is necessary to show that a given theme cross-correlates with itself.

The idealised diagrams of thematic structure represent the essence of the thematic structure of the text in a diagrammatic form, by (i) showing the thematic elements which are the core of the substance of the text material, (ii) showing cross-correlations between themes, and (iii) by not repeating patterns, they represent the structure in its basic form. Linear extended sequences of thematic elements are appended to the idealised diagram. They show the statistically most-likely sequences of themes and clarify the strongest thematic sequences of the text.

When one is faced with a large number of thematic elements drawn from several articles written within the same discipline, such as geography, several characteristics of the themes become apparent. One characteristic is that the themes vary quite considerably in their degree of generality; they may, for example, refer to some general characteristic of steelmaking round the world, or to some aspect of steelmaking at a particular location. The study by Cox (1975) of thirty geography articles revealed an initially bewildering array of thematic elements concerned with the universe of data on which geographers draw. But a second characteristic of the thematic elements is that there are recognisable substantive similarities between groups of them drawn from different articles. For example, a thematic element from one article is concerned with the significance of the location of Brisbane; another thematic element from another article is concerned with the location of steelmaking in South Australia; a further element from a third article is concerned with location theory *per se*. The common element in all of these, that of location, is obvious.

TSA may thus be used to assist in identifying the conceptual structure of a discipline. The grouping of thematic elements directs attention to concepts which are widespread in the discipline and on which many of the ideas of the discipline are organised. This is achieved substantially by empirical means and without the use of *a priori* classifications.

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REGIONAL GEOGRAPHY AND REGIONAL CONCEPTS IN THE PRIMARY SCHOOL

by MARGARET ROW*

Abstract. *This paper considers the intrinsic nature of the concept of region then concentrates on the means by which children are best helped to acquire an understanding of this fundamental concept at progressively higher levels of generality. The highest levels are considered to be beyond the grasp of primary school children. Regional geography is not seen as a satisfactory means of developing the attainable conceptual development and the value of the regional approach in geographic education is shown to lie elsewhere. Explicit, repeated and concrete experience with the regional method using a child-centred approach is advocated as the best means of developing the modes of thinking and subsumable concepts that underpin the concept of region.*

"Because the use of regional concepts is unavoidable among people thinking about the world, educators in geography are obliged to help them add to the store, accuracy and content of such concepts" (Kostbade, 1968, 7). This paper seeks to explore ways in which this can be done effectively. The concept of region has attracted relatively little attention from educators, however, the debate amongst geographers has not always clarified the issues. Hence, the first section contains brief definitions of the terms incorporating region and regional. It is noted at the outset that the coincidence of desired and actual ends requires a concordance of content, teaching methods and children's capabilities, all of which will be stressed throughout the paper. Relatively little attention is given to the sequence of conceptual development but an indication is given of the level of sophistication children can attain by the end of the primary school in their use of regional concepts.

The word region is often loosely used as synonomous with area, zone, sector, belt, locality, province, etc., however, in this article it is used in the more technical sense of segment of space with some common characteristic which gives it some quality of unity (after Morrill, 1980, 184 and Kostbade, 1978, 8). A more rigorous definition will be given in the following section as will

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the definitions of the two types of regions. Regional geography and the regional approach are used interchangeably. Both refer to studying an area in a manner that stresses the relationships between various natural and human elements within that area while attempting to convey its distinctive nature. Synthesis rather than a study of the separate elements within the specified area is the goal. The regional method refers to the process of areal generalization, to the steps by which a region or set of regions is created either by division or agglomeration (see McCaskill, 1973, 74). Regionalization can refer to both the process of region building and to the outcome. Regional concepts are subsumed within the concept of region and include the concepts of areal differentiation, internal homogeneity, boundary, core, criterion (see Table 1). Current usage of the phrase, the regional concept, allows ambiguity. To Kostbade (1968, 6, 8, 9) it is 'the idea of regions', regional concepts and the definitive criteria for a typology of regions but it is not 'the basic regional concept'. Broek (1965, 73) uses it only in this last sense, a usage adopted in this paper where regional concept is synonomous with the concept of region.

THE CONCEPT OF REGION

A region is 'an area throughout which one or more phenomena are sufficiently uniform to permit generalization and sufficiently different from the phenomena in surrounding areas to justify the division' (Minshull, 1967, 18). A region is not a class of real objects such as a river or a hill but a way of seeing the world. It is a mental construct inferred from things observed or measured, a classificatory device (Grigg, 1967) imposed on a specified area as a means of ordering or simplifying that reality. The essential idea relates to a set of rules or conditions that must be satisfied in order to achieve the idealized outcome of areal generalization, the 'region'. Any phenomenon may be the basis for creating a region or set of regions. And by changing the criteria, the same space can be classified in a variety of ways each being a correct application of the regional concept. Thus the concept of 'region' is a spatial form of set theory (Abler, Adams and Gould, 1971, 71) and as such is endowed with simplicity, universality and flexibility combined with rigour. Scant wonder it is an intellectual tool or great value and power.

The nature of the criteria determines the type of region. Formal regions classify area on the basis of similarity of form or some other static phenomenon, e.g. land use, altitude, geological structure, population size or density, percentage classes of some attribute, location quotient scores, etc. and tend to appear relatively uniform throughout, whereas, functional regions are based on dynamic phenomena and tend to appear heterogeneous. Functional regions classify area on the basis of the spatial interaction which is linking places together and though the intensity of the linkage is likely to vary systematically over the region there is, nevertheless, a homogeneity, for instance, the drainage of water in a river basin, the flow of goods, people and energy within a city or between a city and its hinterland. The flexibility of the regional concept allows the virtually universal application of both types irrespective of scale and other attributes of the space. Thus a farm, a school, a city, a nation, the planet earth can be conceptualized as a functioning entity, a single formal region, a set of formal regions or as a set of subsystems (functioning regions). The purpose of the generalization is the major determinant in this choice.

Since a region is any area with characteristics that are homogeneous over that area but make it different from surrounding areas, the important subsumed concepts are clearly identifiable (see Table 1).

TABLE 1: THE CONCEPT OF REGION AND RELATED CONCEPTS

KEY CONCEPT	OPERATIONAL CONCEPTS[1]	SUPPORTIVE CONCEPTS	EXTENSIONS FOR ENRICHMENT
Region	Area/volume[2]	Actual criteria	Scale
	Areal differentiation	e.g. land use categories	Hierarchy
	Criterion/a - presence/absence - operational limits	e.g. soil colour Symbolism used on the map	Schematic diagrams and spatial models descriptive, explanatory and predictive use
	Similarity of defining phenomena & hence of area	e.g. colour coding symbols	
	Difference	Key	
	Edge or boundary/ transition zone		
	Core		

After Hall, 1976, 230

[1] 'relate to precise tasks to be performed in developing an understanding of the key idea.'

[2] Climatologists, geophysists, oceanographers, astronomers apply the concept of region to three dimensional space.

As a concept or 'system of meaning within the mental organization of the individual' (Almy, 1967, 68), the regional concept is abstract, relational, broad in its scope and even broader in its applicability all of which makes its acquisition difficult. (In other respects, the concept's level of difficulty (see West, 1966, 117) varies with the nature of the criteria, the area to be classified and the children's experience, aspects largely within the teacher's control). The regional concept is a powerful ordering system hence its place as a fundamental concept of geography. In Shortle's (1974) hierarchical classification it is a mega spatial concept, and in Stringer's (1975) terminology an organizing concept. Although the concept is capable of abstraction to this high level of generality most encounters are with substantive regions, i.e. particular instances of its application to the real world.

The various levels of sophistication based on the degree of abstraction range from an empirically based continuum of visibly homogeneous areas, a classifying of things that can be observed through inferred processes and relationships to non-empirical theoretical models and the theoretical region (or 'region'). The developmental stages children pass through in their acquisition of the concept of 'region' may well parallel this sequence in that levels of abstraction may approximate to the level of difficulty for the child. Table 2 sets out parallel sequences that are considered to be interrelated. The cognitive outcomes are manifest only in behavioural outcomes and these also indicate the nature of the content which can be successfully manipulated at the stage. In the case of levels of generalization, a stepped pyramid akin to the ecologist's model of trophic levels seems a more appropriate portrayal of the relationships involved within the cognitive sequence than the cone (see Shortle, 1974, 187). The analogy is apt in that the lower levels support the subsequent development by providing the substance of experience to be transformed into a mental structure of increasing complexity and generality. However, unlike the ecologist's model, the preceding levels are not assumed to provide the energy for this transformation. Increasing levels of generalization confer corresponding quantum jumps in the individual's ability to use information. The organisation power of a particular level of conceptual development is directly related to the level of generalization and is depicted as inversely proportional to the mass of new information to be assimilated at that level of abstraction.

The conceptual progression suggested in Table 2 cannot occur in isolation. It must be accompanied by and associated with changes in the thinking processes. Using the regional concept requires the analytical mental processes of classifying and generalizing with the possibility of other strategies being needed in problem-solving situations. Acquiring the habit of thinking in these modes is probably necessary for understanding the concept. In the case of the regional concept, the necessary cognitive structures[1] depend more on strategies for organizing information than on the actual categories themselves a factor to be borne in mind by educationlists.

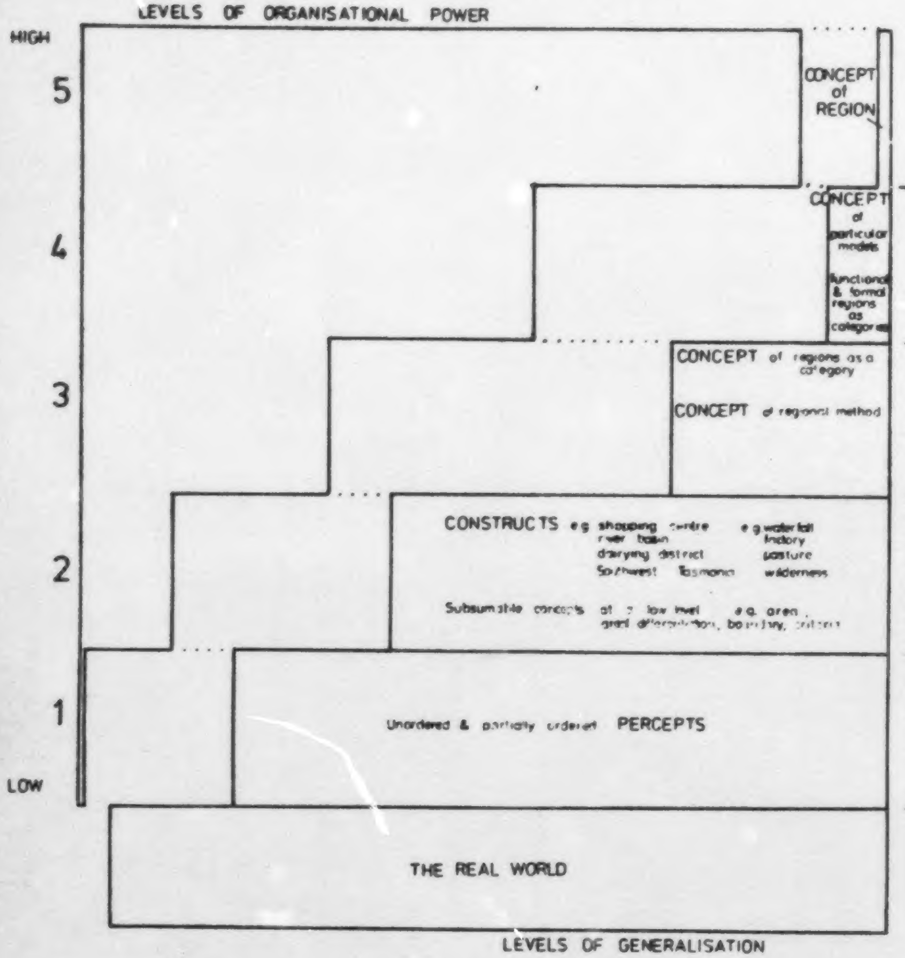
The highest levels of abstraction depend upon formal operations and consequently are years beyond the scope of primary school children. At the other extreme, young children display a sense of region as a bounded space with distinctive properties everytime they say "my area", "your place", "you're not allowed there". Built up through activity and experience, it is a working basis from which to continue development but it is not as yet a concept of region. The particular defining attribute is the important aspect influencing the child's behaviour toward that space and the area so classified is likely to be inflexibly perceived. Grade 6 pupils are considered capable of attaining the early stages of Level 3 (Table 2). It is the educationalist's job to ensure that the foundations are firmly laid and that this level is reached. The remainder of the paper focuses on ways and means of achieving this goal.

THE NATURE AND ROLE OF REGIONAL GEOGRAPHY

The concept of region is implicit in regional geography. The Tasmanian Social Sciences Programme for Grades 3 and 5 (Education Department of Tasmania, 1972, 21; 1976, 13, 17) assumes that one is the means of developing the other but the discrepancy between syllabus demands and children's attainments arouses doubts about the validity of this assumption. Analysis of the role of regional geography in the primary school and the associated teaching methods strengthens these doubts. The positive aspects of studying the physical and cultural attributes of specified regions or sets of regions are fourfold. Firstly, it turns locations into places. Children learn to associate particular characteristics with places and to associate places with specific location in earth space thereby building up a mental map of the world. An extension of this aspect is the learning of spatial reference systems useful for ordering information and as a source of relatively reliable generalizations about locations. These spatial reference systems provide the framework within which information - much of it gained informally through television, newspapers, etc. - can be structured in a coherent and integrated manner. Built up at different scales e.g. at local, state, national and global levels, they will eventually intermesh as hierarchically based concepts are mastered. They also involve constructs such as continents e.g. somewhere in Africa; direction e.g. in West Africa to be more precise; national units or amalgamations thereof such as economic alliances communities, defence pacts, power blocs; latitudinal location such as equatorial, polar, etc. Spatial stereotypes are useful in the reverse situation where expected characteristics of an area are deduced from its location within these frames of reference.

DEVELOPMENT OF THE CONCEPT OF REGION

COGNITIVE OUTCOMES


LEVELS OF ORGANISATIONAL POWER
HIGH
5
4
3
2
1
LOW
CONCEPT of REGION
CONCEPT of particular models
functional & formal regions as categories
CONCEPT of regions as a category
CONCEPT of regional method
CONSTRUCTS e.g. shopping centre, river basin, dairying district, Southwest Tasmania
e.g. waterfall, factory, pasture, wilderness
Subsumable concepts of a low level e.g. area, areal differentiation, boundary, criteria
Unordered & partially ordered PERCEPTS
THE REAL WORLD
LEVELS OF GENERALISATION

BEHAVIOURAL OUTCOMES	NATURE OF CONTENT
Understands 'region' theory of regions	Abstract Theoretical
Can use theoretical models abstract criteria Can classify regions Understands substantive functional regions	Descriptive & explanatory models of the real world Abstract Criteria - statistical [illegible]
Displays correct usage of terminology. can apply the regional method in numerous real world situations Can use simple schematic diagrams as models of known areas	Precise set of rules Precise notation Theoretical ideas applied to & derived from actual examples
Can conceptualise particular instances of of boundaries, substantive regions Recognises particular instances of formal regions & simplest instances of functional regions - uses substantive name Can generalise the simplest of cases Can use particular constructs as criteria	Substantive Concrete Criteria - constructive Empirical Includes examples of readymade regions
Events noticed but incompletely categorised Perceived events lack name or more general category	Concrete

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Secondly, a great range of the phenomena regarded as representing basic categories in geographical description are encountered in their spatial context. Regional geography provides the usual means by which children develop and refine their ideas about phenomena outside their direct experience-about volcanoes and glaciers, equatorial rainforest and hot desserts, monsoon rain and cyclones, windmills and igloos, intensive and extensive pastoralism, and so on, encompassing a variety of landforms, environments, resource usage patterns, lifestyles and livelihoods. This opportunity for accurate and broad conceptual development is important as these concepts with their associated technical vocabulary provide the foundations upon which much of the child's later geographical studies will depend.

Thirdly, the examples of spatial association furnished by the above two roles provide teachers with the opportunity to develop an understanding of simple cases of spatial interaction[2] thereby introducing a new educational element into the situation. The previous two functions focus essentially on the acquisition of knowledge (i.e. the mastery of established fact) and consequently tend to demand only lower order cognitive activity such as recall, comprehension and application. However, understanding any example of spatial interaction involves considerable intellectual effort by each child. Understanding as distinct from memorizing an explanation of an association or a sequence of events requires the student to operate on information, to isolate the significant aspects of the pattern and to connect relevant aspects in ways that not only satisfy the known facts of the case and particular rules of logic but provide meaning to the child so that he can correctly use or transfer this idea to another situation. Like the concept of region, developing the concept of spatial interaction involves the creation of cognitive structures which organize experience into categories and provide ways of manipulating, linking and simplifying these ideas. This approach offers teachers innumerable opportunities to deliberately encourage student practice in higher order modes of thinking. The way the content is handled is critical. This particular role can be eliminated totally by an expository approach heavy with ready-made answers, and drastically reduced by an inappropriate selection of content level and substance, or by insufficient time or guidance. It will be highly demanding of the teacher's skills and time in preparation and of class time in execution.

The precise aims and methods used in regional geography should take cognizance of the relevant experimental work to date and adjust expectations to children's capabilities. The conceptual level at which lessons on spatial interaction are pitched should vary with the grade level. In the lower and middle primary school (up to Grade 4) where most of the time in regional geography is spent in developing basic concepts (Bruner's process of categorizing) and in learning associations, aspects within the children's experience can be related logically and accurately in two different ways to the area under study. For instance, their experiences of wet periods can be applied to areas experiencing frequent heavy rain and some known consequences of this climatic condition can be considered usually in a linear A-causes-B manner (hypothetico-deductive reasoning). Thus, wet days mean wearing raincoats, lunching in the classroom, playing indoor games; the rain brings water - where does the water go? - into rivers. The study area has heavy rain so the rivers should be big - are they? Let's find out. Thus, the consequences known to follow from certain developments formed the basis for predicting some consequences of a new situation, a clear case of hypothesizing with subsequent testing (Crabtree, 1966, 85). (Since this approach depends upon the children's ability to accurately conceptualize, through a transfer of learning, at least some aspects of the situation, it will be of little use in situations far removed from their experience. This is a particularly significant problem in studies of different cultures).

In upper primary school, the earlier tasks continue in a more sophisticated form but the stress is slowly shifting to greater use of the acquired ideas and particularly to the understanding of simple inter-relationships which are partial explanations of key spatial associations. This is in keeping with their greater ability to see relationships and to make generalizations. However, the number of aspects to be handled simulatenously should be few in number, should relate to aspects already within the child's experience (that is, be concrete) and the relationship should entail straightforward and fairly obviously linkages thus ensuring that the relatively rapid closure typical of this age group does not preclude an accurate conclusion. Simple cases of feedback or obvious cases of incompatible land uses within a single area can be understood by this age group. Their understanding of particular spatial interactions arises from an integration of various separate, disparate but significant aspects of the area under study. This is undoubtably synthesis, the major goal of regional geography. While a deeper understanding of the relationships awaits the development of formal operations, this simpler form of synthesis can be accomplished through experiences of spatial interaction.

Fourthly, the study of sets of regions extends the children's idea of areal differentation and broadens their experience of the range of criteria considered relevant in regionalizing. But, despite syllabus demands to the contrary, the notion of 'region' is not readily developed beyond the rudimentary level of areal differentiation and the word tends to remain synonomous with area, zone belt, sector, locality, etc. Regional geography uses 'ready-made' regions where the emphasis is on the phenomena prepackaged within predetermined boundaries and it is not simply a fault of the instructional method that students seldom question or are encouraged to question the regionalization involved. It is the nature of regional geography to stress the particular outcome not the process of regionalization. For all practical purposes, the choice of criteria, their application and the location of the boundary are fixed and typically regarded as immutable. Fixed expectations limit mental flexibility and make it difficult for students to see alternative solutions (Levine, 1971). At least, such rigidness may only inhibit the development of the concept of region; at worst, blocking interference from misconceptions about the nature of regions may nullify later efforts to develop the concept.

DEVELOPING THE CONCEPT OF REGION

Concepts are formed through experience and it is by design not chance that the teacher's role has broadened from the dispenser of knowledge to a provider of learning experiences, ideally, of experiences which generate the desired outcome efficiently and pleasantly. This change in philosophy demands more of teachers and of pupils, and the accomplishments should be greater. Relevant and appropriate experience requires that educational methods and content accord with the capabilities of the children. Active and direct involvement with exemplary concrete examples are good guides to the first two aspects. The third determines the details, the precise strategies, the actual substance and reasonable standards or expectations. The concept of region is developed through repeated use. The most direct, effective and pertinent experiences will involve children in creating their own regions, in using the regional concept in its fullest sense. The following is, therefore, a discussion of the regional method in the primary school.

The regional method translates theory into practice. The steps are simple enough. Step 1 is the selection of purpose, area and appropriate criteria; Step 2, the application of criteria to the objects found in that area; and Step 3, grouping the 'like' areas and excluding the unlike thereby creating a set of regions.

Fieldwork ensures direct involvement with real objects hence its value as a source of efficient and successful experience. Field study or field testing[3] are the most appropriate strategies. Photographs, both oblique and aerial, hardware models and simple, large-scale maps, however, could also provide a suitable empirical base for similar exercises. Ideally, the introductory experiences should be with areas which can be divided into several visibly homogeneous zones. Obvious variation in slope, vegetation cover, height of buildings, volume of traffic or land use can provide the basis for region building. To be suitable, an area should also offer opportunities for reclassification based on another criterion.

Typically, the teacher selects the purpose, the study area and the criteria. While practice with regional concepts and the regional method is an explicit goal, the children will be aware only of an immediate, substantive objective. The criteria must satisfy this other goal. If the task is to be child-centred, then, it is the children who either individually or in groups apply this classification to occurences of the selected phenomena in the selected area. This is a mapping task. (The use of particular maps may eliminate this step of ascribing class to objects, but generate the difficulties associated with interpretation and conceptualization. To a lesser extent, the same is also true of photographs). It is essential that the criteria are simple, clearly defined, understood by the children and easily recognized. Associated classificatory problems should be easy to resolve thus minimising student frustration while providing a challenge that encourages divergent but logical thought in an otherwise convergent thought exercise. It should be remembered that children in the lower grades are engaging in the important task of learning to abstract, that is, to identify and to concentrate on the relevant but to ignore all other attributes of a phenomenon. They are also learning to discriminate, to detect the subtle difference between similar but not identical categories. For example, the concept of house stresses the residential function and ignores the size, shape, style, building materials, age, actual occupants and surroundings but it also excludes motels, apartments and highrise buildings. Their limited grasp restricts the number of criteria they can handle at any one time. In this case use a single attribute or a few related categories, e.g. land use as house/not a house or pasture/cropped land/land not used for farming, building materials as brick/weatherboard, age of housing as old/new/not certain. The means of recording and of representing the data must also be within the children's capabilities.

When the distribution of the selected characteristics is known, then, the next step is region building. This is more demanding than the classificatory and mapping tasks upon which it is empirically based. Unless the teacher makes use of the fieldwork and mapping in some such way, the map becomes an end in itself and major educational opportunities for developing more complex thinking strategies are lost. Use of the information should extend to recognizing patterns of distribution including associations, seeking relationships, attempting to identify factors and processes which create the observed reality. The adjustment for grade level should be in the complexity of the content and the level of understanding sought not in the operational task. The younger children need practice in analysis, synthesis and critical evaluation also. Areal generalization involves children in grouping the location of like occurrences together while simultaneously excluding the unlike. Perceptual and conceptual problems are likely to arise. For instance, the division into regions is enactive only with hardware models. In all other cases, the children must use iconic or symbolic portrayal of phenomena located correctly in a two-dimensional version of space. The choice of representation is important. Clear pictorial forms or colour-coding which creates definite blocks of colour on the map may be the most useful here. Children also need to accept that regions are likely to be of differing size and need not be contiguous. Unlike idealized versions, real world situations are likely to be flawed by a limited inclusion of alien elements within an otherwise homogeneous area, e.g. one bakery in a residential zone. Children may not be readily convinced that this unsatisfying situation is allowable.

Drawing boundaries which satisfy all criteria may provide an intellectual challenge or be a source of frustration leading to loss of interest. Make the task simple enough. Do not demand more reflective thinking than the children can give. Reaching a conclusion or closure will be most rapid in the lowest grades. Children in the lower and middle primary school grades are likely to put the cart before the horse. They seem to attach great significance to boundaries but relatively little to core areas where the defining characteristics are strongest. Suitable strategies to circumvent this problem are to refrain from drawing the edges while emphasizing the core possibly by shading it alone and leaving gaps between cores or by varying the intensity of colour so that it fades out toward the boundary. Alternatively, use transition zones depicted as shaded bands but avoid sharp lines. Why not give the children concrete experiences with boundary areas? To see that, for instance, the junction between farmland and the build-up area is confused along the main road but clear cut elsewhere.

TABLE 3: DEGREE OF DIFFICULTY ASSOCIATED WITH SOME ASPECTS OF THE REGIONAL METHOD

Easiest —— Moderately difficult —— Most Difficult

CRITERIA

1) ATTRIBUTES

Simple —— complex
known —— unknown
touchable —— observable —— abstract
static —— processes (observed) —— processes (inferred), relationships
clearly defined —— ambiguous or vague
easily recognised —— difficult
simple presence or absence —— defined classes

2) NUMBER USED CONJOINTLY

one —— few (related) —— few (unrelated) —— many

NATURE OF THE AREA

1) PROXIMITY OF LIKE AREAS

contiguous —— non-contiguous

2) INTENSITY OF PRESENCE OF DEFINING ATTRIBUTE(S)

uniformly homogeneous — core & periphery — intensity varies irregularly

3) BOUNDARIES

sharp demarcation — transition zone (narrow — broad) — true continuum

DATA SOURCE

direct experience —— indirect experience
fieldwork, hardware models —— large scale photographs — large scale maps — other maps, statistics.

Note: These aspects need to be considered together, not separately.

The regional concept becomes a device for internally organizing information only when it is capable of application to other relevant situations. It is of prime importance that children experience repeated opportunities to apply the regional method. As in all concept formation, the general must be extricated from the particular. 'Region' is an abstract idea. Abstraction of its key attributes will take time and sufficient contact with positive and negative examples before the processes of abstraction and discrimination can create a clear and transferable category. Certainly the first, and probably all the early experiences will be tied to specific examples. Furthermore these experiences will be more involved in developing an accurate construct of the actual criteria or the outcome or an adequate concept of criteria than of region. Experience in the earlier years revolves around discovering the land use zones near the school, finding the catchment area of the school or local shop or creek, investigating the regions along a stretch of river or at the back of the beach etc. The task remains one of identifying and grouping like areas but the outcome will be classed as shopping centre, residential zones, farmland, forest, rapids, riffles and ponds, and other useful constructs. Such experiences constitute a firm basis for less tangible but more powerful outcomes. Familiarity with the mechanics of region building provides a solid grounding for the formal attention given to the theoretical aspects of the regional concept in later years of schooling.

Development of the concept of region is a long drawn out process dependent upon frequent, active and direct involvement with the regional method which culminates in an understanding of the general principles. The nature of the student's contact is crucial. The term frequent refers to the repeated opportunities for practice, active to teaching methods which ensure that each child engages in the appropriate intellectual activity, and direct to the provision of suitable concrete experiences. Depth of coverage should extend of explicit experiences of regions as spatial set theory and ensure familiarity with the regional method as these are the bases from which an understanding of the key idea will evolve. While many of the cognitive structures, both conceptual and operational, developed by regional geography and by the application of the regional method show overlap, the latter provides a more efficient and successful means of developing the fundamental concept of 'region'.

NOTES

1. 'Cognitive structures' is used in the sense of 'existing organisational properties of prior learning'. (Crabtree, 1966, 84).

2. Charlotte Crabtree's experiments with young children were, in fact, aimed at achieving an understanding of particular spatial interactions and not the more limited goal or 'areal' associations as claimed (Crabtree, 1966, 84).

3. Field study is directed exploration and field testing controlled inquiry. See Hall, 1976, 250 for fuller definitions.

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RESEARCH IN GEOGRAPHICAL EDUCATION

by JOHN WOLFORTH*

Abstract. *Geographical didactics, as an area of study distinct from geography, has a weakly developed research dimension. Research of the learners' relationship to place and space rather than to place and space themselves, since it is directed towards classroom practice, has a large applied element. The main types of research possible in geographical didactics include studies related to spatial cognition, to curriculum theory, including means-ends and process models of the curriculum, and to the relationship between geography as science and geography as didactics.*

Among the various branches of geography, geographical education has the most weakly defined research dimension. Other branches, of both physical and human geography rely on research for their continued growth, and few would be taught today at university level in ways that are not radically different from those in which they were taught a generation ago.[1] Most have changed almost beyond recognition. This is not so of courses in geographical education, the 'methods' courses of university Faculties of Education, where much of the content concerning pedagogical skills specific to geography, such as the interpretation of topographical maps, aerial photographs, diagrams and graphs, is still more or less the standard fare of geographical educators of a previous generation. Some new skills have been added to the geography teacher's bag of tricks, including games and simulations or the interpretation of Landsat imagery, but geographical education has not yet been transformed by research and epistemological debate in the same way as has, say, urban geography.

It is symptomatic, perhaps, that there is no distinctive way to describe those who are specialists in the transmission of geographical knowledge and whose research is focussed on this area. "Teacher Trainers" is too crude and circumscribed a description of their role, whilst the more usual "geographical educators" is too comprehensive. Are not all, indeed, "geographical educators", from the primary school teacher exploring with his class the local community to the specialist in periglacial processes leading her graduate seminar? For the sake of greater precision, the French practice of using the term "geographical didactics" might, although cumbersome in translation, provide a more distinctive way of describing what such people see as their field of interest. However, let it not be supposed that the use of a distinctive label would of itself ensure the development of a distinctive and respectable research dimension.

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The reason for the poor development of research in geographical didactics are numerous. First, those who practice this branch of geography in the universities often do not perceive themselves as being quite the same as their colleagues in other branches. To state the position brutally, geographical education is not seen as being very important in the hierarchy of the discipline. A recent survey, admittedly of a small and not very systematically selected cross-section of members of the Canadian Association of Geographers revealed that, while:

> "to encourage the advance of geographical studies and research in Canada," and
>
> "to facilitate the exchange of ideas among geographers in Canada",

were seen as appropriate tasks for the Association by a large percentage of respondents, only a handful thought it was the Association's job to,

> "improve the teaching of geography of Canada"[2]

This is not to imply that many individual geographers have not made a distinguished contribution to the development of geography teaching or indeed that the Association itself, through its Education Committee, has not done so.

It is rather to suggest that, for many academic geographers, geographical education, or more precisely the teaching of geography in schools, is seen as something apart and to which a scientific community, committed to a common method of enquiry and reporting could make no conceivable contribution.

To some extent, there is justification for the low status of geographical education. Whilst the science of geography has experienced, with other desciplines, an almost embarrassing growth of periodical literature, it is remarkable that in neither English nor French are there journals devoted exclusively to reporting research in geographical didactics, the one possible exception being Geographical Education, published annually by the Australian Geography Teachers' Association. There are, of course, many journals devoted to transmitting teaching ideas to teachers, such as, to take Canadian examples, Ontario's *Monograph* or Quebec's *Geographie Didactique* and *Geoscope*. But the ideas presented in such journals are rarely if ever, informed by research. They are merely good "recipes" which innovative practitioners have found to work in their own classrooms.

Part of the problem undoubtedly arises from a practical consideration concerning the ambivalent role of geographical educators in Canadian Universities. The sixties was a decade of unparalleled quantitative growth in Canadian education, of frantic school-building programs to accommodate the children of the post-war baby boom, and of accelerated demand for new teachers. Many new appointments were made to the goegraphy departments of University Faculties of Education at the time and those who came did so either with research experience and academic qualifications in other areas (such as curriculum theory or a geographical specialism other than didactics) or with no research experience at all. Many of those who were appointed at this time had demonstrated their competence as superior classroom teachers rather than as researchers. Moreover, in the early years of such appointments it was often difficult to redress the imbalance between practice and research: time and energy was simply too absorbed in turning out yet more and more teachers with the basic survival kit of classroom skills to engage in introspection. The skills that were transmitted were consequently the tried and true, the conventional wisdom of geographical education's own particular folk tradition.

However, all this has shown signs of changing. The present volume shows some evidence of the variety of research activities being engaged in by geographical educators, and while few universities offer a formal doctoral program in geographical education *per se*, a growing number of these dissertations, and projects attest to burgeoning research activity in Geographical education in many countries.[3]

The purpose of this essay is to try to draw together some loose threads, to attempt to clarify what is meant by research in the didactics of geography, to differentiate it from research in geography itself, and to suggest possible avenues for such research.

Geography as Science and as Didactics

It is first necessary to draw a distinction between the function of scientific geography, as reflected in the content of university courses and scholarly writing, and the functions of geography as a subject in the school curriculum. At one time, when regional geography reigned supreme, there was a considerable conformity between them, and school geography could rightly be seen as a watered down version of the pure spirit served up at university. Even later, at the height of the so-called quantitative revolution, the innovative approaches in school geography which motivated such British books as *Frontiers in Geographical Teaching*[4] and *New Directions in Geography*[5] borrowed from a methodology which had galvanized geographical research. Today it is much harder to detect points of similarity, and the gap between geography at school and university does indeed appear to be growing[6]. This is especially evident in Canada where a survey of provincial curricula[7] reveals that geography courses are founded either upon a regional base or upon one which draws from an interdisciplinary, problem-centred approach. In contrast, university courses are more obviously rooted in one or other systemic branch of the discipline.

Consequently, in Canada as elsewhere, geographical education cannot be seen as simply the process of transmitting at the level of the school child a distillation of the body of knowledge which goes under the name of geographical education is shown by the useful work carried out at the Information and Documentation Centre for the Geography of the Netherlands in Utrecht, where a model has been developed showing how information generated by the *science* of geography may be translated into materials and related activities suitable for the *didactics* for geography.[8] This kind of work, drawing its inspiration from Bruner's dictum that it is possible to teach anything in some intellectually satisfying way to a child at any level, has undoubted usefulness for many kinds of geographical output, particularly that of a substantive nature. Increasingly, however, much of what might be called frontier research in geography is either of doubtful relevance to the classroom, or involves analytical techniques which loose their impact if presented in an abbreviated or simplified form. This is a point which will be elaborated later.

In physical geography, the shift towards the study of process, often involving quantitative analysis over a long period removed (without putting anything in its place) the solid, eminently teachable credibility of Davisian morphological models. It is only recently that process-based textbooks have appeared at the University level, let alone that of the secondary school.[9] The situation is even cloudier in human geography where a loss of confidence in the epistemology of logical positivism has resulted in a divergence of approaches, on the one hand towards those have a stated political commitment, and on the other towards those that are based upon introspection and subjective appraisal.[10] This has left the 'new geography' of the seventies on somewhat of a limb.

The way out of the dilemna is to try to see geography as science and geography as didactics as falling into two different categories of activity and to recognise that although didactics may draw from science when it is appropriate to do so, this will not always be the case. The difference resides in the fact that, while geography as science is directed essentially by curiosity about places or about space, depending on which side of the methodological fence one sits, geography as didactics is directed by curiosity about the learner's relationship to place and space.

This distinction also points the way around a criticism suggested recently by Gregory in his thought provoking, but inconclusive, analysis of the development of geographical thought. The approach exemplified by such projects as the American HSGP or the British GYSL, he says, is unlikely to have profound educational effects on a wide audience,

> because ... even if they succeed in substituting a different image, they are still using the same camera: they remain committed to a positivist epistemology which makes social science an activity performed on rather than in society, one which protrays society but is at the same time estranged from it.[11]

Geography as didactics is capable, if separated from geography as science, of devising ways in which students, as representatives of society, interact with the environment in ways that produce learning. The task then of research in geographical education can be seen in broad outline as being concerned in one way or another with enquiry about the nature of this interaction.

One further distinction must be made however, between geography as science and geography as didactics, before the form this enquiry takes is detailed. This is the distinction between work that is "pure" and work that is "applied". Research in geography, like that of any other science, is of its very nature "pure" in that its objective is the construction of a body of theory. This is not to say that much "pure" research in geography may not be found to have practical application, or indeed that some research may not be be specifically directed by the need to find a solution to some practical problem, whether in stream hydraulics or in planning. For geography as didactics, however applied work is prominent. While in geography as science, applications flow out of pure research, in geography as didactics, pure research is directed by the need to find and to verify better forms of applications.

If, as in figure 1, geography as science and as didactics are portrayed in a Venn diagram, then in geography as didactics, the largest area is occupied by applications. That is to say, more thought and activity will inevitably be directed towards improving instructional practice, whether in writing textbooks, participating in curriculum projects, or simply planning imaginative lessons. Nonetheless, it is important that the area representing research in geographical didactics should overlap that representing application and that, as far as possible, the interaction between the instructor, the learner and the subject material should be informed and guided by the findings of research. All too often in the past has it been guided by faith alone and much work remains to be done on evaluating the effectiveness of well-tried instructional strategies.

But what of the relationship between geography as didactics and other fields? Obviously, if the coherence of the discipline is worth maintaining then there must still be extensive borrowing from academic geography. It is important that a good portion of both the content and the methodology of school geography should be derived from the geography which is reported in the research literature. If, as is often the case, geographical educators find little in that literature which seems relevant to their needs it may be because geography as a science has become too arcane. Relevance to teaching might not, after all, be a bad acid test for the output of geographical research.

Besides drawing from geography as science, geography as didactics needs to look to other fields for research direction. First, the growing body of theory on how spatial learning takes place, arising from the seminal work of Piaget and Inhelder,[12] is of particular interest, if only because within academic geography, it has stimulated research on spatial behaviour in general.[13]

Secondly, the theory of curriculum development, with its roots in philosophy psychology and sociology, provides some stimulus for research in geographical didactics. Questions concerning the place of geography in the total spectrum of knowledge are of importance, if only to make clear the role that geography can play, in combination with other components of the curriculum in the learner's intellectual and social development.

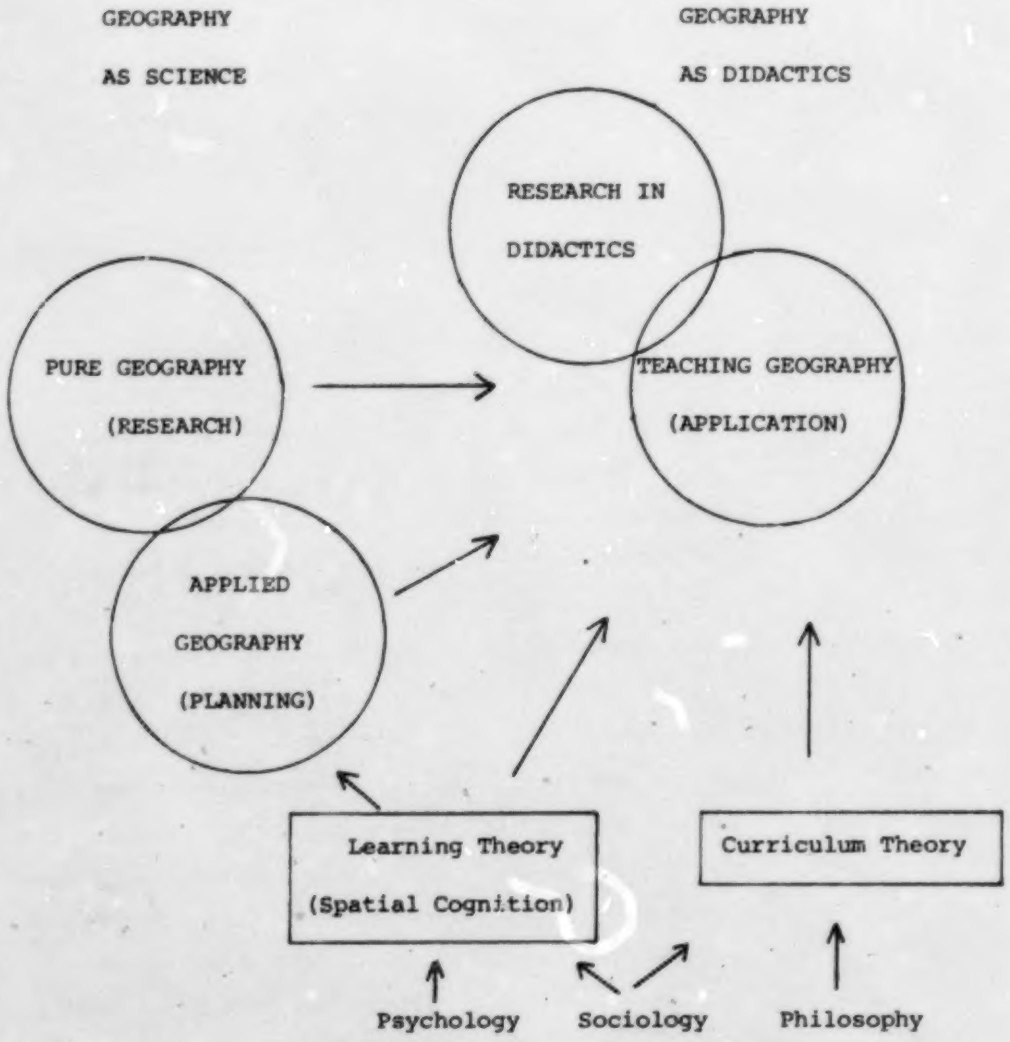
GEOGRAPHY
AS SCIENCE
GEOGRAPHY
AS DIDACTICS
RESEARCH IN
DIDACTICS
PURE GEOGRAPHY
(RESEARCH)
TEACHING GEOGRAPHY
(APPLICATION)
APPLIED
GEOGRAPHY
(PLANNING)
Learning Theory
(Spatial Cognition)
Curriculum Theory
Psychology
Sociology
Philosophy

Figure 1: RELATIONSHIPS BETWEEN RESEARCH IN GEOGRAPHY AND IN GEOGRAPHICAL EDUCATION.

In general, then, if some kind of taxonomy of research in geographical education were to be attempted, it would focus upon these interfaces:

I. The interface between geographical education and curriculum theory.
II. The interface between geographical education and learning theory.
III. The interface between geography as didactics and geography as science.

The remainder of this paper will elaborate upon the kind of research which might be undertaken in these three zones. Undoubtedly, the catalogue will not be exhaustive but may be useful in at least providing a map of present and future activity in the field. Since, as has been suggested, the area of overlap between the purist's definition of research and application is a broad one, the distinction will not always be made with precision.

SOME DIRECTIONS FOR RESEARCH AND DEVELOPMENT IN GEOGRAPHICAL EDUCATION

I. Studies Related to Spatial Cognition

Several directions for research are apparent in the area of spatial cognition. First are questions of how children come to know space and place, and whether there are differences in spatial cognition between different groups of children (for example, between boys and girls, or between children of different cultural backgrounds). Related to these are questions of perception, which are not the same as questions of cognition. The child's image of the world can be considered at the microscale, where important work has been done on how children construct their own world in their local environment, worlds which may differ markedly from those of adults.[14] On the other hand, work at the macroscale has tended to focus upon children's preferred areas, in the form of so-called mental map construction.[15] For example, a recent international project of the I.G.U. has compared how children of a number of different countries rank other countries as places to live or to visit.[16] Questions which require further investigation and which arise out of work on preferential patterns, concern what children believe other places to be like, especially places they have never visited. A recent study of British childrens' images of Canada,[17] although concerned more with geographical knowledge than perception *per se* revealed some alarming misconceptions. More cross-cultural work of this kind would be of value and would in turn give rise to other questions concerning the source of childrens' images of elsewhere, whether TV, travel literature, hearsay or formal teaching, and of the relative strength of these influences.

Tied in with this concern are questions of how children "make sense" of the images of place and space that are conventionally presented to them as instructional media. Milburn[18] has discussed how childrens' mapping abilities develop and how they can be guided, and the important work of Blaut and Stea[19] showed, in opposition to the Piagetian view of the very young child's ability to decentrate, how these abilities can be initiated by working with aerial photos and models. But what do children actually make of the small scale maps that they see in atlases and do they see the map symbolisation in the way that we, as geographically trained adults, think they see it? One cannot but recall the oft-quoted misconception of Huckleberry Finn concerning the "colours" of the American states, a misconception shared in less extreme form by all those children who believe the green areas on the relief map indicate grasslands.

Work of this kind would provide a useful guide for application in what might be called the remedial area, since it is obviously desirable that children should have a "correct" image both of their local environment and of the wider world. At the local level, for example, Clabrough's[20] work in devising activities designed to improve the spatial abilities of so-called 'slow learners' is of interest. At the global level, if the now somewhat old-fashioned view is accepted that one at least of the tasks of geography is to teach something about other countries, then a useful starting point might be childrens' own naive preconceptions.

II. Studies Relating to Curriculum Theory

Many of the more important books which have appeared recently in the field of geographical education have been concerned with geography's role in the school curriculum.[21]

At a time when there is pressure in many places for emphasis on a "core curriculum"[22] stressing the so-called basics, geographers feel the perennial need to justify their subject's existence within the spectrum of the educational system's offerings. This in itself has prompted some attention to curriculum theory. In addition, the influence of geography projects such as the American HSGP or the British GYSL, 14-18 and 16-91, Projects[23] has been to focus on the process of curriculum development and dissemination. Out of these two stimuli, a number of important issues have arisen.

It would certainly be beyond the scope of a short paper to enter in any substantial way into the debate on curriculum theory, except to draw attention to the implication of some of its issues to research in geographical education. Elsewhere, Jones[24] has discussed the objectives model of curriculum development outlined by Tyler[25] and elaborated and operationalized by Bloom and his associates, in that bible of curriculum writers, the Taxonomy of Educational Objectives[26]. There is no question that this model has had strong and continuing influence on curriculum development and that it points to further research in identifying appropriate behavioural objectives for geography, as well as in developing instruments of evaluation. It is by no means a dead horse to be flogged in vain. Within geography's current post-positivistic debate concerning the discipline's role as a humanist field, or as one directed towards political action, questions concerning educational aims and objectives are very pertinent. Work could usefully be done to locate specific geographical teaching objectives along the vectors associated with aims that are related to the needs of society, those that are related to the learner's personal development and those that are determined by the structure of the discipline itself. An analysis of existing syllabuses in these terms would be a useful guide as to which master (or combination of masters) they serve and why. Beyond this, work could also usefully be carried out on whether a relationship exists between the specific objectives of a given geography syllabus and the broader aims of the educational system to which it contributes. Questions in this area can be especially important in a changing cultural context such as that found in developing countries.[27]

But perhaps questions also need to be asked concerning the appropriateness of the objectives model for all geographical activities. Is geography supposed to be the kind of subject Postman and Weingartner identify in their "vaccination" theory of education; namely

> a subject is something you 'take' and when you have 'taken' it, you have 'had' it and if you have 'had' it you are immune and need not take it again?[28]

Or is it predominantly a subject for which the end products are neither specific skills, nor specific knowledge, nor even specific attitudes and values, but rather a questioning mind? Peters has suggested that the key procedures, concepts and criteria of any subject are problematic, the focus of speculation rather than mastery.[29]

The handbook for the British 14-18 Project[30] identifies three different models of teaching style; (1) the transmission - reception model in which the teacher is the authoritative source of information which is important to the pupil; (2) the behaviour shaping model in which the teacher is the provider of structured learning experiences leading to the achievement by the pupils of specified objectives; and (3) the interactive model, in which the teacher is mediator between the subject material and the pupil and in which teacher and pupils develop understanding together through their mutual interaction with the subject material. This categorisation suggests that something more like the process model of Stenhouse[31] might be an alternative yardstick to the objectives model against which to evaluate and develop geographical syllabuses. (Ed. note: see the pages by Fien and Murray, this volume).

In summary then, different research activities are conceivable in the relationship between geography as didactics and curriculum theory which, for the sake of convenience, may be grouped under the two major models identified. These would include in a by no means exhaustive list the following:

1. The Objectives Model
    a) The development of behavioural objectives and instruments of evaluation for those aspects of geographical didactics where they may appropriately be used (for example, map reading, interpretation of remote sensing imagery, quantitative methods and the interpretation of geometrical models such as Horton's stream networks of Christaller's central place system).
    b) The locating of specific objectives within a map of the broader aims of educational systems, especially in cross-cultural comparisons.
    c) The development of hierarchies of instructional activities and evaluative procedures related to hierarchies of objectives.
2. Process Models
    a) The analysis of processes of curriculum change based either upon empirical historical research, upon diffusion models or information systems models.
    b) Studies of values and of ways of constructing curricula with the express purpose of producing attitudinal change. For example, the work of the Canada Studies Foundation had as at least an implicit aim, that pupils should more highly value things Canadian.
    c) Evaluative studies investigating the procedure of existing curriculum projects and of their underlying philosophies and strategies for developments and implementation. Projects to be considered are now quite numerous and could include, besides the American HSGP, the British Schools Council's GYSL, 14-18 and 16-19 Projects mentioned above, also the Schools Council's 8-13 Social Studies Project and Environment Studies Project, the American Earth Science Curriculum Project, the German RCFP, the Dutch Participation-Project Randstadt,

the Australian SGEP, and others.

Not falling easily under either of the two headings identified above are research questions about the "sharp end" of curriculum development; namely, about what goes on, to use the now familiar cliche, at the chalkface. We need to know more about the effectiveness of different teaching strategies (for example, video vs. traditional chalk-and-talk, teaching in mother tongue or in language immersion situations). More needs to be done on the value of geography as a vehicle for teaching skills in other areas, such as those of numeracy or the use of language.

III. Studies Related to the Interface between Science and Didactics

Finally, attention must be given to the important area concerned with the relationship between geography as science and geography as didactics. It was said at the outset, almost by way of a statement of faith, that there has to be some kind of relationship between university and school geography. The reasons for making this assertion are worth spelling out in a little detail. First, although the nature of academic disciplines owes something to their historical development, as scholars such as Hirst[32] and Phenix[33] maintain, they nonetheless have a claim to independent existence by virtue of the fact that each represents a coherent way of looking at one aspect of human experience by a mode of enquiry and a frame of reference which is, by and large, agreed upon by practitioners. Whether geography is a "field" or a "form" of knowledge may be beside the point[34] which is that, if it is indeed worthwhile to study people and environment in a framework which is both global and spatial, then that study is, by definition, geography, whether conducted as a research or a didactic activity. Thus school teachers should be able to look to pure geographical research as a source of both substantial knowledge and methodology.

The research problem for geographical educators is to find means of translating, or in the terminology of the Utrecht school referred to above, of "processing" the output of geography as science so that it has pedagogical value. When geographical research is concerned with essentially empirical enquiries within a specified regional frame, this process presents few problems since it is largely a matter of selecting and if necessary editing source materials which enable pupils to recapitulate the investigative procedures of the original researcher. However, when the major emphasis has been, as it frequently has in recent time, upon the investigation of models *per se* then other problems of both a philosophical and practical nature arise.

During the sixties, geography elaborated the links between what have been called synthetic statements, or those whose validation requires empirical observation, and analytic statements, such as in mathematics or formal logic, which have a truth arising from the definition of the terms in which they are stated. Geography moved across the spectrum from being a largely 'factual' science depending on synthetic statements to being one which is at least in part a 'formal' science, depending on analytic statements. It would be inappropriate here to discuss this movement in detail as it has been discussed by Harvey[35], Gregory[36] and many others. However its relevance for geography as didactics lies in the suggestion that an appropriate research task might be to develop what could be called touchstones of pedagogical relevance.

A review which the writer conducted recently of British General Certificate of Education examinations at the Advanced level showed a depressing number of questions on urban geography concerned with the pure geometry of Central Place Systems. It might be argued of course, that such questions test the pupil's capacity for logical and ordered thought, to which the rejoinder would be that these capacities may be tested more efficiently by questions in, say, pure mathematics examinations. Manipulating K-3, K-4, and K-7 networks may be an interesting intellectual game, but it does not seem to have much to do with understanding the way in which real systems of cities and towns work, which should surely be the prime focus of geographical enquiry.

It is in situations such as this that research in geographical didactics can play a role. It was suggested earlier in this paper that research in geographical didactics is motivated, not by curiosity about place and space, but by curiosity about how information about place and space is learned. In selecting either substantive content in methodology from academic geography, the critical question is, "What is its pedagogical value?" It may be that, in some cases the answer lies in the suitability of a particular activity for developing intellectual skills. In others, a particular body of geographical information or analytical skills may convey something worth knowing about society and how it works, or it may, as in the welfare approaches to geography[37], be a vehicle for social critique. In yet others, geography may be a means of assisting the pupil to find out more about him/herself, and through this, about the human species. In all cases, the criterion is teachability and pedagogical value.

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MAKING SENSE AND LOSING MEANING IN GEOGRAPHY EDUCATION RESEARCH

by LEO BARTLETT*

Abstract. A lot of research in geography education is experimental and psychostatistical. It has its place. But in taking up this "narrow view of science", the emerging community of researchers in geography education may be making sense and losing too much meaning for themselves because of their failure to examine the assumptions underlying their choice of research paradigm. There is a need to supplement this dominant form of research with a style that appeals to the judgement of the participants rather than offer them results. This style is descriptive and is concerned with interpretative frameworks and the study of instances in action. Unless assertive ideologies which focus on single study research are considered, the outcome of research in geography education may be an academic striving to make meaning with an accompanying but liberal dose of non-sense.

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"The task of research is to make sense of what we know"
Rob Walker

My theme is not new to the educational research community at large. And yet I could speculate that my theme is new to the emerging Australian community of researchers in geography education - many of whom are 'new' to research - represented by the group present at this conference. I want to discuss the directions research in geography education is taking, and the dangers inherent in the 'inflexible' research style of many researchers. In doing this, I shall i) take up the notion of disciplinary growth in geography and the ways in which geography educators have attempted to make meaning of their task; ii) consider the current contributions of education; and iii) interpret the above and suggest how we, as a community of scholars, can make sense (with some loss of meaning) by firstly ensuring that we do not institutionalise the knowledge industry that is rapidly developing in geography education, and secondly by adopting different ways of thinking about the research enterprise.

THE DISCIPLINARY GROWTH OF GEOGRAPHY EDUCATION

My starting point is a paper offered by Cox (1980) entitled *Geographical Education - Emerging Sub-Discipline?* I have problems in understanding the idea of a sub-discipline for several reasons. The term 'sub-discipline' suggests geography education is 'less than' or 'under' the two 'disciplines' or a poor cousin because it is an "amalgum of geography and education". I do not think we should concede a lesser role for geography education if we *must* focus on the search for its substantive structure. More importantly however, is the fact that education itself is not a discipline nor is it discipline-free. One of the principal problems in research in education is that it has been seen as a social science and/or as a fertile field for psychologists, sociologists and others to cultivate their produce. Few have seen the 'disciplines' practised within education as rich background for the development of a discipline-free mode of inquiry. The disciplinary status of geography education has important implications for our research, but this is not my principal concern in this paper.

Despite doubts about the titular adequacy of Cox's paper, the idea of 'models' of growth representing three periods of development has merit. My interest is in the third phase, but, put briefly, the first two phases look something like this. *Pre 1970: The Method Approach* was a period of advice, description and prescription. Teachers listened and accepted the methods and technology of teaching from status writers who authorised their work without apparent undue concern for rationale, justification or empirical support for their statements.

> "The writings of Scarfe, Long, Fairgrieve and the Sydney Teachers' College School of the fifties and early sixties are filled with curious circularity in citing each other as substantiation."

Research in geography education consisted of the learned *exhortations* of the authoritative if not prestigous few who fed on themselves and provided the educational wares for the practitioners.

The second phase is characterised not by exhortation but by *translation* and is labelled the *1970's: Objectives Model of Geography Education*. Researchers then (and now) generally employed the rational planning curriculum approaches of people such as Tyler, Taba and Wheeler. Research relied heavily on borrowing and adapting from educational literature. The method writing of the pre-seventies became the movement discussions of the seventies. Both of the above 'models' could be interpreted as geography education in evolution and in search of a substantive base to authorise the research enterprise. The knowledge resulting from research from the two periods was derived by inquiry of a particular style; one that offers authoritative results, is non-empirical and draws on a data base that is found in the experience or history of the researcher or in the literature of other disciplines.

Since we are only now emerging from this second 'model' of disciplinary growth it may be well worthwhile reflecting for a moment on this period. What we have seen emerging is what Sklair (1973) terms "the knowledge industry". No longer could geography educators or researchers of the *Objectives Model* act as generalists because of the sudden explosion of knowledge which was aided by technological advances and which was promoted by improved communication systems made accessible to wider audiences.

The response of the seventies was pre-eminently entrepreneurial. The research effort in geography education consisted of an ample consumption of the available 'new' knowledge digested by the most enterprising among us. The very quantity of information required organisation into a vertical division of knowledge; hence the emergence of a 'discipline'. This interpretation could apply to many disciplines, particularly geography. One further characteristic is that the knowledge of the discipline tended to become institutionalised, the property of the few who controlled its consumption by their actions. The emergence of active subject associations was one form of evidence of this trend.

The interesting feature of geography education is that the community of scholars in this second phase - represented by colleagues such as Biddle, Blachford and others - appeared to argue as geographers, not geography educators. There was minimal dialogue about *educational* research. The Blachford-Johnston debate of the mid-seventies was about geography as a discipline, not about education as a discipline or as a social science. The concern was with control of organized knowledge from within the discipline of geography. Education was the translated commodity which allowed geographers to be called educators. Undoubtedly, our concern was with the new movements in geography and toward the end of the seventies, with the conceptual approach to learning derived from a growing conviction about the substantive nature of geography.

AN AUTONOMOUS MODEL OF RESEARCH?

This leads us to the *Autonomous Model* of geography education. This is the 'model' of greatest interest to us and the one I wish to contest most. Undoubtedly there has been a shift in thinking and a penchant for a style of research which is empirical (compared to the cerebral and crystal ball gazing research - certainly legitimate, not always successful - of the pre-1980's). But I question the i) genre of research style or ideology from which this move originates and ii) the inflexibility of research methodology used by researchers who are engaging in empiricism. Both of these are inter-related since one gives rise to the other. I shall take them separately.

IDEOLOGY AND RESEARCH

Firstly, research style or ideology. Taking up Vaughan and Archer's (1971) notion, one could say that in contemporary educational research there are two principal ideologies, *dominant* and *assertive*. Most recent research in geography education - witness the papers offered at this conference - have been positivist in approach. Quite clearly the positivist paradigm is *dominant*. Oddly enough, this is the same situation in contemporary educational research. So it is not too difficult to conclude that while there has been an apparent shift in thinking among geography education researchers, the shift has been nothing more than translation from the dominant ideology of education. (Or is it from geography where the same situation exists?) Hence we are really located in Cox's second model; we are not autonomous. To flagellate ourselves yet further. Even if we have translated this positivist paradigm into our research enterprise, we seem to be only distantly aware of the assertive ideology which in contemporary educational research is now beginning to impact on the wider community of scholars. Perhaps we are more ignorant than autonomous. I want to come back to this assertive ideology because it is really an important issue in this paper but first it may be useful to suggest why we have a unitary philosophy of research and what positivism means.

There are a number of comprehensive summaries of positivisitic philosophies (Kolakowski, 1972). Stated briefly, positivism is characterised by three principal tenets (Von Wright. 1971). The first is *methodological monism* or the idea that there is one scientific method which is adequate for the diversity of subject matter of scientific investigations. The second is that the exact natural sciences, such as physics and mathematics, set a *methodological standard or ideal* to be emulated (for their degree of perfection) by all sciences including the humanities. The third tenet is probably critical to the philosophy of positivism and is concerned with its peculiar view of scientific explanation.

> "Such explanation is, in a broad sense, 'causal'. It consists, more specifically, in the *subsumption of individual cases under hypothetically assumed general laws of nature, including 'human nature'*".

The attitude towards finalistic explanations, i.e. towards attempts to account for facts in terms of intentions, goals, purposes, is either to reject them as unscientific or to try to show that they can, when duly purified of "animist" or "vitalist" remains, be transformed into causal explanations. In brief, positivistic educational research represents a "narrow view of science" (Dunkel, 1972). Now, while I may reject the tenets of positivism, I recognise the legitimacy of its use by others. Research style is a question of personal choice as is one's philosophy of life. I find it difficult to understand, however, that, while we say we are all different and have different world views, the majority of us *reproduce* and follow a unitary positivist style of research.

The answer lies maybe in the notion of reproduction. In our academic and government institutions man-made powerful structures have developed over time. Academic institutions require of their subjects a research effort. Political and government institutions fund that effort. I want to argue that the methods and world view of the positivist paradigm are aligned with these funding and academic agencies (and this includes AGTA which can bestow approval and prestige) which are socially and economically - but more particularly academically - legitimated and reproduced.

Legitimation is provided by the use of methods taken from the natural sciences - note the tenets of positivisim above - and imbued with the belief that scientific "truth" has been achieved. Findings which invariably use numerical measures are offered to the policy decision-makers (this includes all types of decisions from financial to curriculum) and this is conducive to their discourse.
(It is for this reason perhaps, Australian science educators have less difficulty in attracting research funding). The evidence is usually statistical and offers results at a social distance. I want to pursue this further under the second point raised about methodology. But to conclude this point with another perspective. Ciccourel (1964) argues that quantitative produces of research are attuned to the institutional structure of modern society especially the "logical-material-physical view of the world" embodied in the concern with rationality and efficiency in bureaucratic institutions (Holland and Bartlett, 1977). "Legitimacy is achieved by ordering and reporting data in particular ways irrespective of the structure of the social acts originally observed." A positivist style of research supported by the norms of quantification can be easily reproduced and multiplied.

ASSUMPTIONS UNDERLYING RESEARCH

Every research act is founded on a set of assumptions related to a philosophy of inquiry. From this develops methodology. The positivist paradigm has one principal method - survey analysis. I want to compare survey analysis with my preferred style of research, case study method, because the former is the emerging form which geography educators in Cox's autonomous 'model' appear to favour and because I will suggest that the latter provides a style of research which will help bring the flexibility of approach I spoke about earlier in this discussion.

Survey analysis attempts to establish numerical relationships among variables or categories (usually pre-specified) and typically to describe these relationships in terms of correlation coefficients (survey analysis is not survey research). The assumption is that there is a pool of data which is sampled and resampled to identify the degree of association among the available measures. The statistical procedures used usually employ "regression analysis" which includes multiple correlation, discriminant analysis and canonical correlation.

Case study differs in that it investigates single settings. Each case is empirically distinct; it is an *instance* of a class or population. Cases cannot be thrown together or aggregated as in sampling. In survey analysis, cases are *representative* of the population. This is probably the basic distinction between the two styles of research approaches

There are a number of assumptions upon which survey analysis relies (Hamilton, 1976). These are not the topic of this discussion, but since survey analysis appears to occupy such an important emphasis among geography educators, I shall outline them briefly.

Assumption 1. *Social sciences are more complex than natural sciences. Therefore, multivariate procedures only should be used.*

The task of science is not to explicate complexity but to eliminate it by searching for regularity through regression analysis techniques. But our social world per se is not problematic, only our understanding of it. The social world is not necessarily more complex than the natural world; it depends on our interpretation of the social world.

Assumption 2. *Theoretical concepts can be defined by direct reference to observable empirical attributes.*

Can certain phenomena (teachers, pupils ...) be treated as sets of measurements? Is the whole simply the sum of the parts? Can unobservable phenomena (i.e. behaviours that cannot be observed consciously) be reduced to lower levels of significance (i.e. to the observable)? It would seem that concepts and empirical attributes (if preference scales where the idea of 'strongly agree' is equivalent to the number 5) are not interchangeable. There is a discrepancy between concept and empirical data (the problem of construct validity). In contrast, case study explores this discrepancy in developing new conceptual frameworks.

Assumption 3. *The phenomena or system studied extends unchanged through time and space.*

Sampling leading to generalisation (of the survey analysis kind) requires uniformity of nature. To extrapolate from instances in a sample, members of the population must be empirically identical with members of the sample. It then becomes possible to extrapolate across time or from results in say England to results in Australia for the same properties of the sample under review. Cronbach (1975), a devoted empiricist, recently recognised that no research was context-free and spoke about "generalisation decay". This is probably the greatest limitation of survey analysis which relies on generalisation from the sample aggregate to the universe of people, objects and events. Cronbach (1975) observes

> "As he goes from situation to situation, his (the researcher) first task is to describe and interpret the effect anew in each locale, perhaps taking into account factors unique to that locale or series

> of events...As results accumulate, a person who understanding will do his best to trace how uncontrolled factors could have caused local departures from the model effect. That is, generalisation comes late, and the exception is taken as seriously as the rule". (Cronbach, 1975. p. 124-125)

In fact this statement outlines basic assumptions underlying case study research.

Assumption 4. Large samples suppress ideosyncrasies

They don't. Attributes common to the many, may not always be the most important in helping us understand the social phenomena we observe. Understanding may be in the residual rather than in the explained variance.

Assumption 5. Social and natural sciences share a common objective i.e. the discovery of general laws which can serve for explanation and prediction.

Similar purposes do not require a unity of method. Educational phenomena is created through the activity of individuals and there is no reason to assume the methods of the physical sciences, i.e. survey analysis, always or ever apply.

I have dwelt on survey analysis because researchers in geography education may be unthinkingly translating a dominant ideology from contemporary educational research without seriously considering the assumptions upon which survey analysis within the positivist paradigm relies.

WHAT RESEARCH?

The task of research is to make sense of phenomena, to dismantle it, to reconstruct it and communicate its meaning to an audience. I have argued in this paper that the emerging community of geography educators should not continue to be seduced by the events of the seventies but should build on them. Invention rather than translation ought guide the research effort. But invention cannot be designed or achieved by a researcher style that is based on a unitary scientific method.

Perhaps what is required is an educational research style which treats geography education not as geography or as education but as an enterprise independent of major disciplinary colonizing powers. Or perhaps we as a community of researchers in geography education ought to accept research as rhetoric (Levin, 1979), using a range of research styles and theoretical concepts from individual disciplines (Petrie, 1979) as well as specific research models or prototypes. I believe we should be seeking a disciplined but discipline-free style of research (focusing on the spatial concepts in geography) offered by both assertive and dominant ideologies. Research that requires the study of samples *and* the study of cases (Stenhouse, 1979a). The assertive ideology we have seen contrasts with the dominant positivisitic ideology. The assertive ideology may be described as interpretative and is best described within the context of case study method (McDonald and Walker, 1975; Stake, 1978a).

The distinction between the two forms of ideology is not that the one relies on psychostatistical techniques (Fienberg, 1977) to support its arguments (Bartlett, 1980). The prinicpal distinction is that one employs samples and survey analysis, the other the single study. The one measures and "sees", the other sees and then only, perhaps measures (Stake, 1978b).

Our research efforts call for a style that appeals to the judgement of teachers rather than offer them results. Improvement in the teaching of geography rests upon improving the art of the teacher. Offering multivariate analysis of results in mapping skills tells the teacher little about *how* the skill is to be taught, only *that* it can be taught at a particular age level (and of course the significant differences in probability terms if it is not). This style of experimental or psychostatistical research offers and appeals little to teacher judgement because it can only communicate in a form of knowledge quite different from that of teachers (Park, 1967). This "knowledge about" is formal, rational, systematic, based on observation of behaviours which are tagged, regimented, made precise and substituted for concrete reality. The single study offers "acquaintance with" leading to understanding (not necessarily explanation in search of laws). It is

> "the sort of knowledge one inevitably acquires in the course of one's personal and first hand encounters with the world about him. It is the knowledge which comes of use and want rather than through any sort of formal and systematic observation". (Park, 1967:34)

As researchers and as geography educators we therefore have much to offer in ordering the experiences of geography teachers by appealing to their judgement not their mathematics. This requires the realistic portrayal of cases rather than the abstract representation of samples. Cases cumulate and retrospective generalizations of the instances we portray can improve practice by application of the teacher's professional judgement to the case in question (Stenhouse, 1979b).

REVIEW

I have travelled over much ground roughly. The theme of my paper has been to review and interpret how current research in geography education is attempting to make sense but may be losing too much meaning. I have reviewed the antecedents to our current research enterprise and have suggested that our present position is largely one of translation of the positivist paradigm represented in the psychostatistical (survey analysis) and experimental research mode. We are in a very limited sense autonomous. I have extended discussion on the problematic of this dominant ideology. I have argued that this style of research yields on form of "knowledge about" which is quite distinct from an assertive or interpretative ideology which seeks to understand phenomena in the study of instances in action. The latter is required to supplement the former; to develop knowledge that is peculiar to geography education but not necessarily disciplinary; and to provide the diversity of research practice (leading to cumulation of knowledge) which is not currently evident among us. In suggesting this, I have emphasised that research style is a question of choice; that we need to consider carefully *how* we research and the assumptions underlying the style we choose; and for those of us who are 'new' to research that the choice itself be neither activist nor a response to pressures to do research for political status or organizational gains.

Unless a range of research styles other than that based on the dominant ideology are considered, the outcome of research in geography education may be an academic striving to make meaning with an accompanying but liberal dose on non-sense.

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424

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